UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL INC.,
ZTE (USA) INC.,
and
ZTE CORPORATION,
Petitioners,

v.

3G LICENSING S.A.,
Patent Owner.

Case No. IPR2020-01157

U.S. Patent No. 7,274,933

DECLARATION OF DR. APOSTOLOS K. KAKAES IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,274,933

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TABLE OF EXHIBITS

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1001	U.S. Patent No. 7,274,933 (“the ’933 patent”)
1002	Copy of Prosecution History of the ’933 patent
1004	U.S. Patent Appl. Publ. No. 2003/0022689 (“McElwain”)
1005	U.S. Patent Appl. Publ. No. 2004/0204136 (“Uchida”)
1006	U.S. Patent No. 7,027,813 (“Hicks”)
1007	3rd Generation Partnership Project; Technical Specification Group Core Network; NAS Functions related to Mobile Station (MS) in idle mode (Release 5) (3GPP TS 23.122 V5.2.0) (“TS-23.122”)
1008	3rd Generation Partnership Project; Technical Specification Group Services and System Aspects – Service aspects; Service principles (Release 5) (3GPP TS 22.101 V5.8.0) (“TS-22.101”)
1009	3rd Generation Partnership Project; Technical Specification Group Terminals; Characteristics of the USIM Application (Release 5) (3GPP TS 31.102 V5.3.0) (“TS-31.102”)
1010	Declaration of Craig Bishop
1011	Complaint for Patent Infringement, No. 1:19-cv-01247-LPS (D. Del. July 1, 2019)
1012	Complaint for Patent Infringement, No. 3:19-cv-01694 (N.D. Tex. July 15, 2019)
1013	Complaint for Patent Infringement, No. 1:19-cv-01140-MN (D. Del. June 20, 2019)
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1016	EIA/TIA-553 Standard (AMPS)
1017	Excerpts from EIA/TIA/IS-54 Standard (Digital AMPS)
1018	Excerpts from TIA/EIA/136.1 Standard
1019	Excerpts from TIA/EIA/IS-136.2-A Standard
1020	Excerpts from TIA/EIA/IS-95 Standard
1021	Excerpts from T. Halonen et al., "GSM, GPRS and EDGE Performance: Evolution Towards 3G/UMTS" (2d ed. Wiley 2003)
1022	3rd Generation Partnership Project; Technical Specification Group Terminals Specification of the Subscriber Identity Module – Mobile Equipment (SIM - ME) interface (Release 1999) (3GPP TS 11.11 V8.6.0) ("TS-11.11")
1023	Excerpts from A. Mehrotra, "GSM System Engineering" (Artech House 1997)
1024	U.S. Patent No. 5,950,130 ("the '130 patent")
1025	U.S. Patent No. 5,862,471 ("the '471 patent")
1026	U.S. Patent No. 6,195,532 ("Bamburak")
1027	U.S. Patent Appl. Publ. No. 2001/0001875 ("Hirsch")
1028	U.S. Patent Appl. Publ. No. 2002/0111180 ("Hogan")

I, Dr. Apostolos K. “Paul” Kakaes, hereby declare as follows:

I. ASSIGNMENT

1. I have been retained on behalf of Dell, Inc., ZTE (USA) Inc., and ZTE Corporation (collectively, “Petitioners”) to offer technical opinions related to U.S. Patent No. 7,274,933 (“the ’933 patent”) (Ex. 1001). I understand that Petitioners are requesting that the Patent Trial and Appeal Board (“PTAB” or “Board”) institute an *inter partes* review (“IPR”) proceeding of the ’933 patent.

2. I have been asked to provide my independent analysis of the ’933 patent in light of the prior art patents and publications cited below.

3. I am not, and never have been, an employee of any of the Petitioners. I received no compensation for this Declaration beyond my normal hourly compensation based on my time actually spent analyzing the ’933 patent, the prior art patents and publications cited below, and issues related thereto, and I will not receive any added compensation based on the outcome of any IPR or other proceeding involving the ’933 patent.

II. QUALIFICATIONS AND EXPERIENCE

4. I am over the age of 18 and am competent to write this Declaration. I have personal knowledge, or have developed knowledge of these technologies based upon education, training, or experience, of the matters set forth herein.

5. My CV, which includes my complete education and work experience, is included as Appendix A hereto. I describe several relevant aspects of my experience below.

6. I have almost forty (40) years of experience in electrical engineering and computer science and in fixed and mobile communications networks. I attended the University of Colorado from 1974 to 1980, during which I earned a Bachelor of Science (B.S.) and a Master of Science (M.S.) in applied mathematics with a minor in electrical engineering. I attended the Polytechnic Institute of New York between 1982 and 1988, during which I earned a Doctor of Philosophy (Ph.D.) in electrical engineering, with a thesis titled "Topological Properties and Design of Multihop Packet Radio Networks." While pursuing the Ph.D. degree, I held a joint appointment as Special Research Fellow and Adjunct Instructor at the Polytechnic Institute of New York between 1985 and 1986.

7. Between 1982 and 1987, I worked at AT&T Bell Laboratories in Holmdel, New Jersey. While at AT&T Bell Laboratories, I worked on modeling, analysis, design, and performance evaluation of voice and data networks. I developed algorithms for DNHR (Dynamic, Non-Hierarchical Routing) used in the telephone network. I also analyzed advanced data services and formulation of long-term plans for development of enhanced data services and network design tools to support such services.

8. I was an Assistant Professor of Electrical Engineering and Computer Science at The George Washington University (GWU), Washington, D.C., between 1987 and 1994. During my association with GWU, I taught graduate courses in the area of communication engineering, including communication theory, coding theory, voice and data networking, and mobile communications.[1] I also received several research awards/grants, including the prestigious NSF Research Initiation Award.

9. In 1988, I founded Cosmos Communications Consulting Corporation ("Cosmos"), which is a private communications engineering consulting firm specializing in mobile communications, and I have been the President of the company since its founding. Since 1994, I have worked full-time at Cosmos. At Cosmos, among various activities, I have consulted on high level technology-related issues and trends to corporate entities, governmental agencies, and international organizations, such as the United Nations. I have provided technical consultancy to engineering firms, operators, and equipment vendors on issues related to existing or evolving technologies for mobile communications, and to the investment community on issues related to both fixed and wireless communications technologies. I have served as consultant on both civil and criminal legal cases,

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[1] In the early 1990s I developed and taught the first course on Mobile Communications taught at GWU to Electrical Engineering graduate students.

including several patent infringement cases both at the ITC and in district court. I also participated as a technical consultant in the analysis of large patent portfolios for the purposes of due diligence, sales, and merger and acquisition activities for some of the largest companies in the mobile communications space. These projects spanned a multidimensional spectrum of technologies in both fixed and mobile communications as they have evolved over the past more than thirty (30+) years.

10. Over the course of my career, I have authored and co-authored some thirty (30) publications on various aspects of fixed and mobile communications, as noted in my curriculum vitae. I am a member of the Institute of Electrical and Electronics Engineers (IEEE) and actively involved in the Communications Society and the Information Theory Society of IEEE. Between 1991 and 1992, I served as the Secretary of IEEE Communications Society National Capital Area Chapter. Between 1992 and 1993, I was the Vice-Chair of IEEE Communications Society National Capital Area Chapter. I was the Vice-Chair of the Communication Theory Technical Committee of the Communications Society of the IEEE for the 1993-1996 term, and Treasurer of the Communication Theory Technical Committee of the Communications Society of the IEEE for the 1996-1999 term.

11. I have served as a reviewer for the IEEE, book editors, other technical publications, and various National Science Foundation (NSF) Panels. I have organized technical sessions in technical conferences, including the IEEE

International Conference on Communications (ICC) and IEEE Global Communications Conference (Globecom). I served as the Technical Program Chair for the Communication Theory Mini-Conference in 1992.

12. I am the author of several publications devoted to a wide variety of technologies in the fields of electrical engineering and computer science. These publications are listed on my CV (attached as Appendix A).

13. During my work at Cosmos, I have provided expert advice and conducted extensive training for practicing engineers in the field in diverse networking technology areas, including Wireless Local Area Networks (LAN), Metropolitan Area Networks (MAN), and Personal Area Networks (PAN) technologies, paging networks, ad hoc networks, including IEEE 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), HIPERLAN, Bluetooth, Near Field Communications, and IrDA (Infrared Data Association). My experience includes detailed in-depth analysis of cellular networks operating with any of the available access technologies as standardized in various standards, broadly known as AMPS, GSM, GPRS, EDGE (EGPRS); North American TDMA IS-54 and IS-136, iDEN, IS-95, UMTS, HSPA, and LTE, some of which are also referred to as "1G," "2G," "2.5G," "3G," and "4G." I have experience in the design and implementation of voice and data networking (circuit switching, packet switching including the evolving all-IP-based technologies), traffic engineering, RF design, Quality of Service (QoS) and resource

allocation, MAC protocols, as well as in the design of core networks, both user plane and control plane.

14. Specifically, during the past approximately 35 years, I have been lucky enough to be part of the community of engineers that have contributed to the astounding growth of the mobile communications industry. It started from a niche industry that was thought of as being something for the "rich and the famous" to becoming one of the most wide-spread household concepts, providing useful tools to all segments of the global society, from the wealthy suburbs of New York to the poorest neighborhoods in Africa and everywhere in between.

15. My involvement in this industry included providing consulting services to company executives who needed to make deployment plans, taking into consideration the strengths and weaknesses of the technology, economics, user value, etc. As such, I have developed a deep understanding of all aspects of a given technology, its features, added value, and the like. In addition, my consulting services included developing courses for the companies that were at the forefront of this developing technology. By definition, this new, previously non-existent technology was not taught in university courses, as it was too new. Having developed hundreds of courses over the years and taught thousands of engineers (and non-engineers alike), I have a solid understanding and knowledge of the technical

developments and how their importance fits in the larger puzzle of a fast-developing technology.

16. While deployment and implementation of the technology presented an important set of questions and problems to a given company's leadership, the necessity of progress entailed another set of difficult issues. The decision to move on and abandon a technology which has been good to the company and its customers is not easy. In some ways, change is more difficult than the status quo. However, the status quo can lead to stagnation. Thus in my work, one of the very challenging, and interesting, components have been my consulting services to company leaders on the issues involved in migrating from one telecommunications technology to the next, including from 1G to 2G, from 2G to 3G, and from 3G to 4G.[2]

17. I had to develop a deep understanding (and convey it to the appropriate executives) of the strengths that a new "generation" was bringing to the table, as well as the transition issues and costs that invariably came with a decision to implement it.

18. My consulting included providing training to engineers in the field that were deploying the various networks. For example, I developed courses and provided training and consulting to the engineers deploying some of the earliest GSM networks

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[2] A summary of these technologies will be presented below in Section VI.

in Germany and France, to be followed by many countries in Europe and around the world, including the USA when it was decided that GSM would be used in the USA. Successful deployments of the initial GSM systems were followed by deployments of GPRS and EDGE, which was then followed by deployments of 3G UMTS systems world-wide. Of course, the 3G systems were followed by the currently most wide-spread deployments of 4G systems, also referred to as LTE, world-wide. Thus, my experience includes a deep understanding of the entirety of each system that we broadly refer to as "1G," "2G," "3G," and/or "4G."

19. As my career developed, I also became involved in matters related to intellectual property, and specifically to patents in the space of communication engineering and mobile communications specifically. I have served as an expert witness in a number of cases and testified in a number of trials/hearings, having obviously performed the relevant analysis. Thus, I have developed a comprehensive understanding of what it means for a patent to be found invalid, or what so-called "prior art" teaches and what the scope and content of prior art in the telecommunications field is. Besides my experience in the litigation context, I have advised a number of companies in the broader context of patents in related intellectual property issues. I have analyzed large and small patent portfolios on behalf of companies that were interested in acquiring some or all of a given portfolio. In some cases, my analysis led the companies that had retained me to determine that

they were not interested in pursuing the contemplated acquisition. In others, it led to a "deal," and in some cases a multi-billion dollar deal.

III. APPLIED LEGAL PRINCIPLES

20. In forming my analysis and conclusions expressed in this Declaration, I have applied the legal principles described in the following paragraphs, which were provided to me by Counsel for Petitioners.[3]

A. Anticipation

21. I understand that patents or printed publications that qualify as prior art can be used to invalidate a patent claim as anticipated.

22. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

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[3] I understand that the patent laws were amended by the America Invents Act (AIA), but that the earlier statutory requirements still apply to pre-AIA patents. I have been informed that the '933 patent is a pre-AIA patent, so the pre-AIA requirements control. Unless otherwise stated, my understanding of the law about patent invalidity as set forth in this Declaration relates to the pre-AIA requirements.

23. I understand that a prior art reference "anticipates" an asserted claim, and thus renders the claim invalid, if all limitations of the claim are disclosed in that prior art reference, either explicitly or inherently (*i.e.*, necessarily present).

24. I understand that anticipation in an IPR must be proven by a preponderance of the evidence.

B. Obviousness

25. I understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the art ("POSITA") at the time the invention was made.

26. I understand that a person of ordinary skill in the art at the time of the claimed invention provides a reference point from which the prior art and claimed invention should be viewed. This reference point is applied instead of someone using his or her own insight or hindsight in deciding whether a claim is obvious.

27. I also understand that an obviousness determination includes the consideration of various factors such as: (1) the scope and content of the prior art, (2) the differences between the prior art and the asserted claims, (3) the level of ordinary skill in the pertinent art, and (4) the existence of secondary considerations such as commercial success, long-felt but unresolved needs, failure of others, and so forth.

28. I understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand further that prior art references themselves may provide a suggestion, motivation, or reason to combine, but that at other times the linkage between two or more prior art references is simple common sense.

29. I further understand that the obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

30. I understand that if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique would have been obvious unless its actual application is beyond his or her skill.

31. I also understand that practical and common-sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I further understand that a person of ordinary skill in the art seeking to overcome a problem through invention will often be able to fit together the teachings of multiple publications. I understand that the obviousness analysis therefore considers the inferences and creative steps that a person of ordinary skill in the art would employ under the circumstances.

32. I understand that a particular combination may be shown to be obvious to combine merely by showing that it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a POSITA has good reason to pursue the known options within his or her technical grasp because the result is likely the product not of innovation but of ordinary skill and common sense.

33. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill in the art can implement a predictable variation, the patent claim is likely obvious.

34. It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a POSITA, not just the patentee. Accordingly, I understand that any need or problem known to those of ordinary skill in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

35. I understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not

found explicitly or inherently in the reference but can be supplied by the knowledge or common sense of one of ordinary skill in the art.

36. I understand that secondary indicia of non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; (4) praise of the invention by others skilled in the art; (5) taking of licenses under the patent by others; (6) deliberate copying of the invention; (7) failure of others to find a solution to the long felt need; and (8) skepticism by experts. I understand that evidence of secondary indicia of non-obviousness, if available, should be considered as part of the obviousness analysis.

37. I also understand that there must be a relationship between any such secondary considerations and the invention. I further understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

38. In sum, my understanding is that prior art teachings are properly combined where a person of ordinary skill in the art having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements described in the claims. Under this analysis, the prior art references themselves, or any need or

problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

39. I understand that obviousness in an IPR must be proven by a preponderance of the evidence.

C. Claim Construction Standard

40. I understand that terms appearing in the patent claims are to be interpreted according to their "ordinary and customary meaning" in an IPR proceeding. In determining the ordinary and custom meaning, the words of a claim are first given their plain meaning as they would have been understood by a person of ordinary skill in the art at the time of the alleged invention, in light of the specification and file history. I understand that even treatises and dictionaries may be consulted, albeit under limited circumstances, to determine the meaning attributed by a person of ordinary skill in the art to a claim term at the time of the alleged invention. I have followed this approach in my analysis and have applied the ordinary and customary meaning of those terms throughout my analysis in this declaration.

41. I understand that the words of the claims should be interpreted as they would have been understood by a person of ordinary skill in the art at the time the alleged invention was made (not today). Counsel has instructed me that for the

purposes of this declaration, I should assume that the ’933 patent is entitled to the benefit of foreign application No. EP 03255483, filed September 3, 2003. I have followed this instruction for the purposes of this Declaration. However, the plain meanings/interpretations that I employed in my analysis below would have also been correct if the date of invention was anywhere from the filing date of the foreign priority application (September 3, 2003) to the filing date of the U.S. application that issued as the ’933 patent (September 2, 2004).

IV. PERSON OF ORDINARY SKILL IN THE ART

42. I have been informed that a person of ordinary skill in the art is a hypothetical person who is presumed to have the skill and experience of an ordinary worker in the field at the time of the alleged invention. Based on my knowledge and experience in the field and my review of the ’933 patent and file history, a POSITA at the time of the alleged invention (September 2003) would have had a degree in electrical engineering or a similar discipline, with at least three years of relevant industry or research experience (or additional education). The relevant experience would include a working understanding of the then-existing wireless cellular communications standards.

43. Based on my educational and employment background, I am qualified to provide opinions concerning what a POSITA would have known and understood around September 2003. Indeed, as reflected in my qualifications above, I more than

qualified as a person of ordinary skill in the art as of the relevant dates of the ’933 patent.

V. MATERIALS CONSIDERED

44. I have considered information from various sources in forming my opinions. I have drawn on my decades of experience in this field. I have employed methods and analyses of a type reasonably relied upon by experts in my field in forming opinions or inferences on the subject. Additionally, in preparing this Declaration, I have relied upon the exhibits listed at the beginning of this Declaration, any documents and other information cited herein, and the following patents and file histories related to the ’933 patent:

- U.S. Patent No. 7,460,868 and associated file history;
- U.S. Patent No. 7,596,375 and associated file history;
- U.S. Patent No. 8,275,374 and associated file history;
- U.S. Patent No. 8,472,955 and associated file history; and
- U.S. Patent No. 8,948,756 and associated file history.

VI. STATE OF THE ART

45. In this Section, I present an overview of the most relevant aspects of the technology in the ’933 patent that would have been known and available to a POSITA as of September 2003. In Subsection A, I provide an overview of the wireless network structure and associated standards that have been developed in this

field. In Subsection B, I focus on the aspects within a mobile device (also referred to by other names, such as mobile terminal, user equipment, mobile unit, etc.) that are relevant to the ’933 patent. In Subsection C, I discuss the interactions between the network and a mobile device. I limit my discussion to the interactions that are relevant to the ’933 patent. Said relevant interactions quickly lead to the need to discuss the cases where the mobile is located in places other than its “home network,” generally referred to as “roaming,” which is also discussed in that subsection. Finally, in Subsection D, I discuss aspects relevant to the ’933 patent related to what is displayed on a mobile device regarding the name of a network that the mobile is prepared to use.

A. Cellular Networks and Relevant Standards

46. In this section, I present a technical overview of the various different technologies and associated standards that have been proposed and adopted world-wide in the field of wireless cellular technologies.

47. This subsection proceeds as follows. First, in Subsection 1, I present some of the most fundamental concepts that are equally applicable to all technologies that have been developed over the years.

48. In Subsection 2, I summarize the relevant technical issues in the first widely deployed cellular system, referred to as Advanced Mobile Phone System (AMPS), which was developed in the USA. The successful implementation of

AMPS resulted in its own demise, as it proved to be inadequate to handle the larger-than-expected demand for wireless cellular services. It became apparent that a more efficient system had to be developed, and that basically translated to the need for the new system to be a digital one, as opposed to the simpler analog system that AMPS was.

49. In North America (primarily driven by the USA) a short-lived system referred to IS-54 was developed to be quickly replaced by a better system referred to as IS-136. I present the relevant aspects of IS-54 and IS-136 in Subsection 3.

50. A system in direct competition with IS-54/IS-136 was being developed by Qualcomm in the USA, which matured into the system standardized by the IS-95 Standard, discussed in Subsection 4.

51. While IS-54, IS-136, and IS-95 were being developed in the USA, Europe had taken a different path that became known as GSM, which I discuss in Subsection 5. Unlike IS-54/IS-136 and IS-95, GSM quickly dominated the global market.

52. Once again, the world-wide success of GSM made it apparent that the world-wide "appetite" for mobile communications was larger than had been contemplated. A new system had to be developed. That new system became known as UMTS.

53. As an interim solution on the way to UMTS, GSM was significantly enhanced by the development of GPRS and of EDGE (which is also referred to as Enhanced GPRS). I discuss GPRS and EDGE in Subsection 6. I discuss UMTS in Subsection 7.

54. Finally, in Subsection 8, I discuss the latest system that has been widely deployed world-wide, called LTE.

1. Fundamental Concepts

55. "Wireless" communication necessarily implies that information is transmitted without the use of "wires." This is accomplished by transmitting electromagnetic waves from some point of origin A with the intent that the radio waves will be successfully received at some intended destination point B. Transmission of information can only be accomplished by using a range of frequencies, ranging from some value f_1 to some value f_2.

56. The difference $B = f_2 - f_1$ is sometimes referred to as the "channel bandwidth," or just "channel" or just "bandwidth."[4] As it turns out, when all other parameters remain the same, the larger the bandwidth B is, the more information can be transmitted. However, the range of usable frequencies is limited, thus "spectrum"

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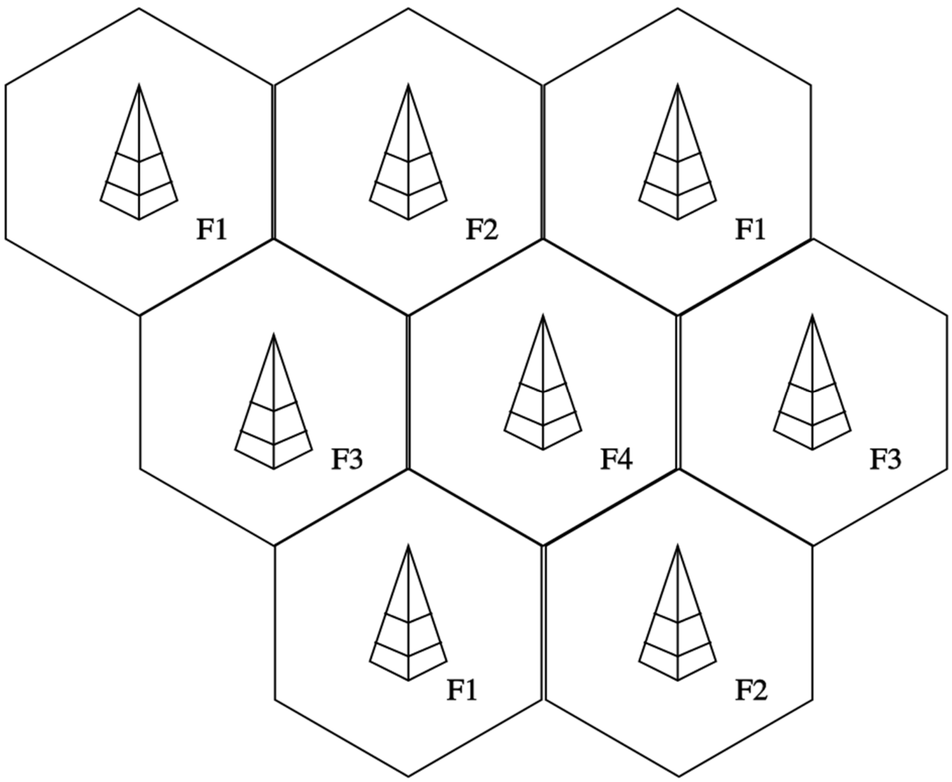
[4] I note that the terms "channel" and "bandwidth" are also used in other contexts, but they are not relevant here.

(*i.e.*, range of available frequencies) is limited. Thus, spectrum is a fundamental resource to be managed and used efficiently. Typically, the available spectrum for any one application is administered and managed by a national agency of a given country. Thus, for example, in the USA it is managed by the Federal Communications Commission (FCC). In the dawn of wireless cellular communications, the FCC allocated 50 MHz of spectrum to wireless operators (companies, also sometimes referred to as "carriers" or "providers"), which I will discuss in more detail in the next subsection, in the context of the first such system in the USA, AMPS.

57. The most fundamental concept in all of wireless cellular systems is that of frequency reuse. As the available spectrum is limited, it is desirable that whatever channels are defined within said spectrum be reused at other locations. However, it is also clear that the further such locations are, the less benefit is derived from reuse. Reusing the channels in a dense manner implies that there will be interference by one user of a given channel to another user who will be close enough. Thus, the objective is to reuse such channels as densely as possible, while managing the interference to not exceed specific levels.

58. As it turns out, hexagons provide the most efficient manner in which space can be covered, when "efficient" is defined in a particular way, which is not relevant for the current analysis. Thus, the fundamental idea is illustrated below,

showing a collection of "cells," each of a hexagonal shape. Notionally, each cell is "served" by a base station located, again notionally, at the cell's center. A critical parameter is the "reuse factor," *i.e.*, how often a given frequency is reused. While this is a non-trivial problem and the answer varies greatly with each system, it is not relevant to the '933 patent, so I will refrain from discussing this aspect of the network's architecture.



59. Clearly, such a hexagonal pattern can be extended to cover an entire "region," however "region" may be defined. For example, it may be a city with its suburbs, a state, an entire country, etc. However, this is where the regulatory structures come into play. Such regulatory structures differ by country, so I will focus on the USA as an example. Different portions of the spectrum have been

allocated by the FCC over the years and the specifics have differed in each such allocation. However, at a fundamental level, they all share some common characteristics, which I will discuss next.

60. The entire USA is "divided" into a number of "regions," taking into account the distribution of the population across the country. While terms such as the "New York City Metropolitan Trading Area" (NYC MTA) have a very well defined meaning, it is sufficient for our purposes to understand that this refers to New York City and "surrounding area." Similarly, the Los Angeles Metropolitan Trading Area (LA MTA) has a similarly well-defined meaning, but it suffices for our purposes to understand that this refers to Los Angeles and its "surrounding area." The "surrounding area" in many cases can be large, in others it is smaller.

61. Through a process that has varied over the years, the FCC has issued one or more (typically more than one) "license" to a company to provide cellular services in each such region. Thus one should expect that a given company, or "provider" or "carrier," *e.g.*, AT&T, has a license in the NYC MTA. Similarly, it is likely that, say, Verizon has another license in the NYC MTA. A third (and even more) carrier may also have a yet another license.

62. Each such carrier operates their own "hexagonal" grid in the specified region. In other words, AT&T may elect to have smaller hexagons (and thus more of them) to cover the NYC MTA, while Verizon may elect to have larger ones (and

thus fewer of them) to cover the same region. Of course, any mixture is possible, but the specific design that any one carrier uses is up to the carrier.

63. One can now consider a mobile device located somewhere in the country—again, I am continuing with the USA example, but the concepts are very similar when considering other countries and/or regions.

64. Consider a mobile device, I will refer to it as MD1 which belongs to a person who I will refer to as "AK," who lives in Washington, DC. AK has chosen to use AT&T as his cellular services provider, *i.e.*, AT&T is "his" carrier and the AT&T network serving the Washington, DC area is "AK's network," often referred to as his "home network." We can assume that there is just one other network in the Washington, DC area, operated by Verizon (even though in general, as I mentioned above, there can be more than one). Clearly, AK expects, and AT&T desires, that whenever AK makes (or receives) a call while in his home network, the call will be completed using AT&T's network.

65. A simple question arises: How does MD1 "talk to the network"? In other words, which base station will serve MD1? This is a considerably more difficult question than one might think. A first attempt at answering this question may be "the closest base station to the MD1." But how would MD1 know which is the closest base station? Furthermore, even if that could become known, it might be that the closest base station is one that belongs to Verizon. So one might modify the

answer by proposing that it be "the closest **AT&T** base station to MD1." But, once again, how can one determine what the distance is from MD1 to the various AT&T base stations and thus pick the closest one? While that is technically feasible, the amount of resources (including time) it would take is totally unacceptable, so this solution is unacceptable; however, its contemplation reveals that, at a minimum, each base station must reveal to the mobile devices that are located within its coverage area its identity. In other words, it must, at a minimum, send some message that indicates that the base station is part of the AT&T, or the Verizon (or some other), network. I will return to this point below.

66. A proxy for distance is received power level, or the strength of the received signal. All other things being equal, the received power by MD1 falls off as the distance from the transmitting base station to MD1 increases. Thus, one could use the received power as a measure of which base station is the "closest." Indeed, that approach gave genesis to a term that has been widely used: "best server," meaning the base station whose received signal is the strongest, *i.e.*, "best."

67. While this approach makes sense, it is too simplistic. In actual networks of today, the process of selecting a base station (or cell, thus often called "cell selection") is considerably more complicated and differs by system. I will consider this point in more detail in Section VI.C below. What matters is the fact that each base station must identify which network it belongs to, as discussed above.

68. The notion of which network a base station belongs to becomes a little more complicated when one considers MD1 moving away from its home network. So, suppose that AK has traveled to Boston. Clearly, the Washington, DC network is not present in Boston. But, we can reasonably assume that both AT&T and Verizon have a respective "Boston network." It is clear that it should be the AT&T network that should serve MD1. The fact that MD1 is away from its "home network" introduces a new set of questions, generally referred to as related to "roaming." While these question can be meaningfully discussed in the context of Washington, DC versus Boston, there is another layer that makes the discussion more complete.

69. Consider MD1 being right on the border between the USA and Canada, *e.g.*, assume AK having MD1 is on a boat on the Detroit river. With AK is his Canadian friend CC having his own mobile device, MD2. CC is a subscriber to a Canadian network, which I will use the hypothetical name Canadian Wireless. It is apparent on its face that AK prefers to use the Detroit AT&T network, while CC prefers to use the Windsor, Canada, Canadian Wireless network. It is thus apparent that each base station needs to identify which network, which includes which country, it is a part of. What if AK then joins CC and travels well into Canada, where there is no AT&T network? One would then hope that AK can still use his device MD1 to make and/or receive calls. That has been accomplished by the various carriers around the world agreeing to provide "roaming services," *i.e.*, serve each

other's customers. That, however, may come at an added cost to the user, *i.e.*, to AK in this example. It only makes sense, and it was done from the earliest days of cellular communications, to indicate to the user the fact that the user is either (a) using his home network, or (b) is roaming in some other network.

70. The notion of "roaming" and what it costs to roam has evolved over the years mostly driven by regulatory and business consideration. For example, in the early days of wireless communications, if AK used his MD1 in Boston (or anywhere outside of the Washington, DC home network) there was a non-trivial cost, a "roaming charge." Thus it was desirable to indicate to the user that he was or was not in the home network. That has changed by now. AT&T now treats all usage by AK in the USA the same. When in Boston, AK is still "roaming" into the Boston network, but there is no additional cost. It thus makes sense that one might want to display "ATT," rather than "ATT Washington," "ATT Boston," "ATT Los Angeles," etc.

71. Of course, the above points are equally valid in countries/regions outside of the USA. In Europe, for example, counties are generally smaller and border regions much more common. The above principles of identifying which network (of which country) a given base station is part of is just as necessary in Europe as it is in the examples discussed above in the context of the USA. Of course, the same applies to anywhere in the world.

72. While the most "visible" aspect of a wireless cellular network is how user information is transmitted to/from the mobile device, there is a whole other dimension that is important: how does the network perform the control functions necessary to operate successfully, including performing such functions as establishing, maintaining, terminating, and billing for the calls? This includes issues related to interacting with external networks, *e.g.*, the pre-existing world-wide voice (and later) data networks. This is generally referred to as "network signaling," or just "signaling" or "network control" or just "control" (and other similar phrases have been used). Much as there is a set of "rules," *i.e.*, a "protocol" for how a network interacts with mobile devices, there is a "signaling" protocol that dictates how network elements communicate with each other and with elements of other networks with which there is a need to communicate in order to provide world-wide user connectivity. The capabilities provided by such relatively advanced signaling protocols have also been referred to as "Wireless Intelligent Networking," or WIN. I will briefly address these protocols as needed in the subsequent sections.

73. Furthermore, the above observations are technology independent. In other words, it does not matter if the technology used is GSM, IS-95, or any of the technologies I will describe below in Subsections 2 through 8.

2. AMPS

74. The "Advanced Mobile Phone System" (AMPS) was the first nationwide wireless communications system standardized in the USA. While it is generally referred to as "AMPS," the actual standard is the "EIA/TIA-553" Standard "Mobile Station – Land Station Compatibility Specification" developed jointly by the Electronic Industries Association (EIA) and the Telecommunications Industry Association (TIA). While earlier versions of this standard exist, I will refer to the one approved on April 19, 1989 and published in September 1989. *See* Ex. 1016.

75. AMPS was an analog system in which, by regulatory structures, 50 MHz of bandwidth (originally it was 40 MHz, but later 10 MHz was added) was divided evenly into two licenses: the "A license" and the "B license." The entire USA was divided into 734 different regions, called Cellular Market Areas (CMA) and an "A license" and a "B license" was awarded in each such region. The B license in a given region was awarded to the then-existing wireline (*i.e.*, "ordinary telephony") company, while the A licenses were awarded by a combination of "comparative hearings," lottery, and auctions. The details of how these licenses were awarded is not relevant. However, a subscriber in a given CMA, the "home" one, would, in general, roam to other CMAs and there was an almost ever-changing evolution of how billing was handled for such roaming usage.

76. The need for each base station to identify the network that it belongs to was present, as I discussed above in Subsection 1. Furthermore, even though AMPS was USA-centric, it was envisioned that Canada and Mexico would also adopt it and possibly other countries as well.

77. Specifically, the AMPS system provided for the following capabilities with respect to identifying networks.

78. First, in AMPS, "[e]ach cellular system is defined by a unique 15-bit digital code, the SID code." "SID" stands for "System Identification." EIA/TIA-553 (Ex. 1016) at vii, 1-4.

> 6. Each cellular system is identified by a unique 15-bit digital code, the SID code (see 2.3.8). The Federal Communications Commission assigns SID codes when cellular system construction permits are issued.

EIA/TIA-553 (Ex. 1016) at vii.

> System Identification (SID). A digital identification associated with a cellular system; each system is assigned a unique number.

Id. at 1-4.

79. The AMPS system defined a "HOME SYSTEM IDENTIFICATION," which is a SID "stored in the mobile station and used to identify the mobile station's home system." EIA/TIA-553 (Ex. 1016) at 2-7 to 2-8.

2.3.8 HOME SYSTEM IDENTIFICATION

A 15-bit system identification (SID_p) must be stored in the mobile station and used to identify the mobile station's home system (see 2.6.1.1.2). The bit allocation of the system identification (SID) shall be as follows:

14 — 13	12 — 0
INTL CODE	SYSTEM NUMBER

The international (INTL) Codes (bits 14 and 13) shall be allocated as follows:

BIT 14	BIT13	
0	0	United States
0	1	Other countries
1	0	Canada
1	1	Mexico

Bits 12 through 0 will be assigned to each U.S. system by the FCC. (See note 13 in preface.)

EIA/TIA-553 (Ex. 1016) at 2-7 to 2-8.

80. Note 13 in the AMPS standard states:

13. As of October 21, 1988, the allocation of SID numbers is under review by EIA TR45 for potential revision to accommodate international requirements. Utilization of SID numbers must be coordinated.

EIA/TIA-553 (Ex. 1016) at vii. It is apparent from the above that while the then-existing standard provided for some international capabilities (*i.e.*, USA, Canada, and Mexico), a broader international scope was being contemplated.

81. With respect to selecting a network, the AMPS standard specified:

2.3.10 PREFERRED-SYSTEM SELECTION

A means must be provided within the mobile station to identify the preferred system as either System A or System B.

EIA/TIA-553 (Ex. 1016) at 2-8. It further specified:

2.6.1.1 RETRIEVE SYSTEM PARAMETERS

If the preferred system (see 2.3.10) is System A, set the serving-system status to enabled; if the preferred system is System B, set the serving-system status to disabled.

The mobile station must then enter the Scan Dedicated Control Channels Task (see 2.6.1.1.1).

Id. at 2-11.

82. The AMPS system also provided for scanning dedicated control channels (*see, e.g.*, Section 2.6.1.1.1) and updated overhead information, including the SID.

> The mobile station must tune to the strongest dedicated control channel and, within 3 seconds, receive a system parameter message (see 3.7.1.2) and update the following numeric information:
>
> • *System identification* (SID_s). Set the 14 most significant bits of SID_s to the value of the SID1 field. Set the least significant bit of SID_s to '1' if the serving-system status is enabled; otherwise, set the bit to '0'.

EIA/TIA-553 (Ex. 1016) at 2-12. I also note that SID_1 referenced above is defined in Section 3.7.1.2.1 in the "SYSTEM PARAMETER OVERHEAD MESSAGE":

> 3.7.1.2.1 SYSTEM PARAMETER OVERHEAD MESSAGE
>
> The system parameter overhead message consists of two words.

Word 1

T_1T_2 = 11	DCC	SID1	RSVD = 000	NAWC	OHD = 110	P
2	2	14	3	4	3	12

Word 2

T_1T_2 = 11	DCC	S	E	REGH	REGR	DTX	N-1	RCF	CPA	CMAX-1	END	OHD = 111	P
2	2	1	1	1	1	2	5	1	1	7	1	3	12

The interpretation of the data fields is as follows:

T_1T_2 — Type field. Set to '11' indicating an overhead word.

OHD — Overhead message type field. The OHD field of word 1 is set to '110' indicating the first word of the system parameter overhead message. The OHD field of word 2 is set to '111' indicating the second word of the system parameter overhead message.

DCC — Digital color code field.

SID1 — First part of the system identification field.

NAWC — Number of additional words coming field. In word 1 this field is set to one fewer than the total number of words in the overhead message train.

S — Serial number field.

E — Extended address field.

REGH — Registration field for home stations.

REGR — Registration field for roaming stations.

DTX — Discontinuous transmission field.

N-1 — N is the number of paging channels in the system.

RCF — Read-control-filler field.

CPA — Combined paging/access field.

CMAX-1 — CMAX is the number of access channels in the system.

END — End indication field. Set to '1' to indicate the last word of the overhead message train; set to '0' if not last word.

RSVD — Reserved for future use, all bits must be set as indicated.

P — Parity field.

Id. at 3-14 to 3-15.

83. The mobile attempts to retrieve a system parameter message on the strongest or the second strongest dedicated control channels of the preferred system (A or B). If it fails to do so on the preferred system, it repeats the process on the other system. *Id.* at 2-11 to 2-12.

84. The AMPS system requires that the mobile perform a scanning operation as part of the "PAGING CHANNEL SELECTION" process defined in Section 2.6.1.2. For example, that standard states: "The mobile station must examine the signal strength on each of the channels $FIRSTCHP_1$ to $LASTCHP_1$. (see 2.6.1.1.2). The mobile station must then enter the Verify Overhead Information Task

(see 2.6.1.2.2)." *Id.* at 2-12. In the VERIFY OVERHEAD INFORMATION task, the mobile is, among other actions, required to:

> 2.6.1.2.2 VERIFY OVERHEAD INFORMATION
>
> The mobile station must set the Wait-for-Overhead-Message bit ($WFOM_s$) to '0'; the mobile station must then tune to the strongest paging channel and, within 3 seconds, receive an overhead message train (see 3.7.1.2) and update the following:
>
> - *System identification:* Set the 14 most significant bits of SID_r to the value of the SID1 field. Set the least significant bit of SID_r to '1' if the serving-system status is enabled; otherwise, set the bit to '0'.
> - *ROAM status:* The mobile station must compare the received system identification (SID_r) with the stored system identification (SID_s). If SID_r = SID_s, the mobile station must compare SID_s with SID_p. If SID_p = SID_s, the mobile station must set the ROAM status to disabled. If $SID_p \neq SID_s$, the mobile station must set the ROAM status to enabled. If $SID_r \neq SID_s$, the mobile station must enter the Retrieve System Parameters Task (see 2.6.1.1).
> - *Local control status:* If the local control option is enabled within the mobile station (see 2.3.9) and the bits of the home system identification (SID_p) that comprise the group identification match the corresponding bits of SID_s, then the local control status must be enabled. Otherwise, the local control status must be disabled.
>
> The mobile station must then enter the Response to Overhead Information Task (see 2.6.2.1).
>
> If the mobile station cannot complete this task on the strongest paging channel, it may tune to the second strongest paging channel and attempt to complete this task within a second 3-second interval. If it cannot complete this task on either of the two strongest paging channels, the mobile station may check the serving-system status: If the serving-system status is enabled, it may be disabled; if the serving-system status is disabled, it may be enabled. The mobile station must then enter the Scan Dedicated Control Channels Task (see 2.6.1.1.1).

Id. at 2-12 to 2-13.

85. Finally, and referring to the last bullet item above, the AMPS system provided for the ability to identify several networks as home networks. This was achieved by using what was called "LOCAL CONTROL." This is accomplished by using a "Group Identification" which is a "subset of the most significant bits of the system identification (SID) that is used to identify a group of cellular systems."

> Group Identification. A subset of the most significant bits of the system identification (SID) that is used to identify a group of cellular systems.

See id. at 1-1. In other words, using "Group Identification," a provider could identify multiple SIDs (networks) as being home networks. At Section 2.3.9, the AMPS standard requires that a "means must be equipped within the mobile station to enable or disable the local control option (see 2.6.2.1 and 2.6.2.5)." *Id.* at 2-8. Thus, support of the local control option is mandatory.

86. It is apparent from the above that even AMPS, the oldest, analog cellular system provided for the ability to (i) scan and receive a pair of Mobile Country Code and Mobile Network Code, (ii) define a home network, (SID_p), (iii) give preference to a home network over non-home networks, (iv) compare the received SID (SID_r) to the home network SID (SID_p), and (v) define a plurality of networks as being home networks.

87. Regarding the network signaling, in conjunction with EIA/TIA-553, a signaling protocol was developed called EIA/TIA/IS-41, or just IS-41. IS-41 provided the necessary signaling for AMPS network infrastructure to communicate with both other elements of the AMPS networks as well as with external networks. IS-41 is not capable of providing a broad spectrum of "intelligent" services and is therefore considered a "pre-WIN" standard. Later developments of IS-41 added some WIN functionality, but that is not relevant to the issues at hand.

3. IS-54 and IS-136

88. AMPS was a good system but it was quickly recognized that the demand for mobile communications far outstripped the capacity of even a great analog system. The industry quickly recognized the need to develop and transition

to a much more efficient digital system. I will address the essentially concurrent developments in Europe in Subsection 5 below, so for now I will continue to be USA-centric.

89. In the USA, it was decided that the new digital system would need to be backwards compatible with the then-widely used analog AMPS system. There were good arguments in favor of both backwards compatibility and in favor of no such requirement, in effect starting with a clean slate. The fact is that the decision was made to insist on backwards compatibility. The effort to create a new digital system backwards compatible with AMPS created two "camps" in the USA: the "TDMA camp" and the "CDMA camp." The TDMA advocates developed a digital, Time Division Multiple Access system, that was standardized in what is referred to as IS-54. The "CDMA camp" developed the first Code Division Multiple Access system, that was standardized in what is referred to as IS-95, the subject of Subsection 4 below. For now I will focus on IS-54 and its sequel, IS-136.

90. IS-54 was a Time Division Multiple Access (TDMA) system, which means that any one channel (*e.g.*, a 30 kHz channel that was used in AMPS for one user at a time) is "multiplexed" across several users. In particular, the IS-54 standard specified that time would be divided into frames, each frame consisting of 6 slots. Initially three and (the hope was) that eventually six users would use the same 30 kHz channel in a round robin fashion. In other words, the successive slots of a

frame would be used by users 1-2-3-1-2-3 and repeated in the next frame. This would, at least to a first order of approximation, triple the capacity of the system.[5] Sharing a channel is made possible by converting speech to digital form (*i.e.*, a sequence of bits), transmitting those bits in bursts (one slot out of every three), and reproducing the speech at the receiving end. As this would happen very fast, each of the three communicating pairs would be under the impression that they each had the channel all the time, when in fact they "multiplexed," *i.e.*, shared the channel.

91. Clearly, this structure entails many, many details of how transmissions and receptions are controlled, executed, maintained, etc. Most of that is irrelevant for our current purposes. What is most relevant is that the network identification and the process of a mobile device scanning and finding the network remained essentially identical to AMPS.

92. One can see, for example, in the EIA/TIA Interim Standard IS-54 (dated May 1990 and revised April 1992), titled "Cellular System Dual-Mode Mobile Station – Base Station Compatibility Standard" (Ex. 1017) at Sections 2.3.8 language that is identical to Section 2.3.8 of the AMPS specification. EIA/TIA-553

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[5] The hope that eventually we would use six users, *i.e.*, in one frame it would be used by users 1-2-3-4-5-6 and repeated in the next frame, never got to enjoy acceptable quality, thus not widely used.

(Ex. 1016) at 2-7; IS-54 (Ex. 1017) at 85. Sections 2.3.10 are also identical in the two standards. *See* EIA/TIA-553 (Ex. 1016) at 2-8; IS-54 (Ex. 1017) at 85. Sections 2.6.1.1 through 2.6.1.5 of IS-54 contains the same information as Sections 2.6.1.1 through 2.6.1.2 of the AMPS standard, organized a little differently, but nonetheless containing all the information contained in the AMPS system. *See* EIA/TIA-553 (Ex. 1016) at 2-11–2-13; IS-54 (Ex. 1017) at 108-111.

93. This is not surprising, as the relevant information (home network, network SID, etc.) does not change because the method of transmission of the information changes.

94. IS-54 was very short-lived and only implemented in a very small number of markets. The pressure coming from Europe was too high. As I will explain below in Subsection 5, GSM was another digital system, also TDMA, but far superior to IS-54. It was recognized that IS-54 would be eclipsed by GSM sooner rather than later.

95. In an effort to salvage the North American-developed TDMA system, an effort was undertaken to adapt it, importing many of the aspects of GSM. The result is IS-136. The intent of IS-136 was to (a) be backwards compatible with AMPS but (b) provide some of the same capabilities of GSM. The specifics of how IS-136 compared to (or differed from) either IS-54 or GSM are not particularly

relevant to the ’933 patent. Again, the reason is the same as above when I discussed the comparison of relevant aspects of IS-54 and AMPS.

96. The formal name of the relevant standard is TIA/EIA Interim Standard IS-136.1, and is titled “800 MHz TDMA Cellular – Radio Interface – Mobile Station – Base Station Compatibility – Digital Control Channel” and dated December 1994. *See* Ex. 1018. It is to be read in conjunction with TIA/EIA Interim Standard IS-136.2-A, titled “TDMA Cellular/PCS – Radio Interface – Mobile Station – Base Station Compatibility – Traffic Channels and FSK Control Channel” and dated October 1996. *See* Ex. 1019.

97. IS-136.2 effectively mimics IS-54, which effectively mimics EIA/TIA-553 (AMPS). *See generally* Exs. 1017-1019. This, once again, is not surprising given the fact that IS-136 was developed in an effort to improve IS-54, so there is a lot of commonality. But IS-136 attempted to incorporate some of the features of GSM. That becomes apparent in the IS-136.1 portion of the IS-136 standard. For example, IS-136.1 includes both a SID and a Mobile Country Code (“MCC”). *See* IS-136.1 (Ex. 1018) at 153, 282. Furthermore, at least no later than the IS-136 system’s development, a network name was provided for displaying to the user using the “Alphanumeric System ID,” consisting of up to 15 alphanumeric characters. IS-136.1 (Ex. 1018) at 189.

98. It is apparent from the above that the IS-54/IS-136 cellular system provided for the ability to (i) scan and receive a pair of Mobile Country Code and Mobile Network Code, (ii) define a home network, (SID_p), (iii) give preference to a home network over non-home networks, (iv) compare the received SID (SID_r) to the home network SID (SID_p), (v) define a plurality of networks as being home networks, and (vi) display a network name ("Alphanumeric System ID"), as defined by the network provider.

99. IS-54/IS-136 continued to use IS-41 for network signaling, as discussed above in the context of AMPS.

4. IS-95

100. As development of the digital, TDMA system (which was standardized as IS-54, as discussed above) was progressing, a newly-founded company in San Diego—Qualcomm—was proposing an entirely novel (at the time) approach to an efficient usage of the spectrum. It was called Code Division Multiple Access (CDMA) and was based on spread spectrum techniques. Since spread spectrum techniques were somewhat counterintuitive, there was a lot of skepticism in the industry about the viability of such a system. But it did mature into a standard, the TIA/EIA INTERIM STANDARD TIA/EIA/IS-95, published in July 1993, titled "Mobile Station – Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System." *See* Ex. 1020.

101. Just as the transition from an analog system to the digital TDMA system was a big step, the transition to a CDMA system was an even bigger step. However, the "steps" are entirely related to how the information is transmitted (and received) between a base station and a mobile. They are not related to what information is transmitted and how a mobile decides to select a specific network, registering with that network and/or indicating to the user what the selection has been. Those are aspects that are just as relevant in an analog network, in a TDMA digital network (such as IS-54/IS-136), or a CDMA digital network (such as IS-95).

102. Thus, just as it was no surprise that the relevant aspects of network identification and network selection that were used in AMPS were also used in IS54/IS-136, it is not surprising that they are also used in IS-95.

103. For example, and not surprisingly, Section 2.3.8 of IS-95 contains the same information that Section 2.3.8 of the AMPS standard contained, as discussed above in Section VI.A.2. *See* EIA/TIA-553 (Ex. 1016) at 2-7; IS-95 (Ex. 1020) at 2-12. Similarly, the requirement to support Local Control Option specified in Section 2.3.9 of AMPS is also specified in Section 2.3.9 of the IS-95 Standard. *See* EIA/TIA-553 (Ex. 1016) at 2-8; IS-95 (Ex. 1020) at 2-13.

104. The ability to identify a preferred system is defined in both the AMPS Standard and the IS-95 Standard as well. Section 2.6 of IS-95 contains much of the same information as the corresponding section in AMPS. *See* EIA/TIA-553

(Ex. 1016) at 2-11–2-31; IS-95 (Ex. 1020) at 2-31–2-57. However, IS-95 leaves the prioritization of system selection to the implementer: "The precise process for system selection is left to the mobile station manufacturer." *Id.* at 6-69. However, it clearly identifies one of the options as being "System A (or B) preferred." *See id.* In other words, it does provide for a selection of a home network over a roaming network.

105. The above is further clarified in Sections 6.6.5.2 and 6.6.5.3 of IS-95. For example, it states: "Systems are labeled with an identification called the system identification or SI; networks within a system are given a network identification or NID." *Id.* at 6-138. In this system, "[a] mobile station is roaming if the stored (SID_S, NID_S) pair (received in the *System Parameters Message*) does not match one of the mobile station's non-roaming (SID, NID) pairs." *Id.* at 6-139. The standard further states that "[t]he mobile station may use the special NID value 65535 to indicate that the mobile station considers all NIDs within a SID to be non-roaming (*i.e.*, that the mobile station is not roaming when operating with any base station in that system)." *Id.* In other words, the IS-95 standard provided a way for identifying multiple home networks.

6.6.5.2 Systems and Networks

A base station is a member of a cellular system and a network. A network is a subset of a system.

Systems are labeled with an identification called the system identification or SID; networks within a system are given a network identification or NID. A network is uniquely identified by the pair (SID, NID). The NID number 0 is a reserved value indicating all base stations that are not included in a specific network. The NID number 65535 (2^{16}-1) is a reserved value the mobile station may use for roaming status determination (see 6.6.5.3) to indicate that the mobile station considers the entire SID (regardless of NID) as home (non-roaming).

Figure 6.6.5.2-1 shows an example of systems and networks. SID i contains three networks labeled t, u, and v. A base station in system i that is not in one of these three networks is in NID 0.

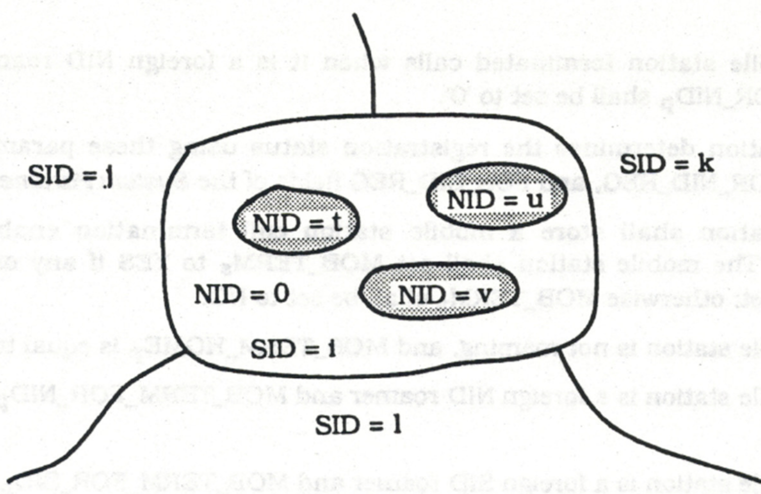

Figure 6.6.5.2-1. Systems and Networks Example

6.6.5.3 Roaming

The mobile station has a list of one or more home (non-roaming) (SID, NID) pairs. A mobile station is roaming if the stored (SID_s, NID_s) pair (received in the *System Parameters Message*) does not match one of the mobile station's non-roaming (SID, NID) pairs. Two types of roaming are defined: A mobile station is a foreign NID roamer if the mobile station is roaming and there is some (SID, NID) pair in the mobile station's (SID, NID) list for which SID is equal to SID_s. A mobile station is a foreign SID roamer if there is no (SID, NID) pair in the mobile station's (SID, NID) list for which SID is equal to SID_s.[20] The mobile station may use the special NID value 65535 to indicate that the mobile station considers all NIDs within a SID to be non-roaming (i.e., that the mobile station is not roaming when operating with any base station in that system).

The mobile station shall store three 1-bit parameters in its permanent memory (see 6.3.8). These parameters are $MOB\_TERM\_HOME_p$, $MOB\_TERM\_FOR\_SID_p$, and $MOB\_TERM\_FOR\_NID_p$. The mobile station shall set $MOB\_TERM\_HOME_p$ to '1' if the mobile station is configured to receive mobile station terminated calls when using a home (SID, NID) pair; otherwise $MOB\_TERM\_HOME_p$ shall be set to '0'. The mobile station shall set $MOB\_TERM\_FOR\_SID_p$ to '1' if the mobile station is configured to receive mobile station terminated calls when it is a foreign SID roamer; otherwise $MOB\_TERM\_FOR\_SID_p$ shall be set to '0'. The mobile station shall set $MOB\_TERM\_FOR\_NID_p$ to '1' if the mobile station is configured

---

[20]For example, suppose a mobile station has the following SID, NID list (2, 3) (2, 0) (3, 1). If the base station (SID, NID) pair is (2, 3) then the mobile station is not roaming because the (SID, NID) pair is in the list. If the base station (SID, NID) pair is (2, 7) then the mobile station is a foreign NID roamer because the SID 2 is in the list, but the (SID, NID) pair (2, 7) is not in the list. If the base station (SID, NID) pair is (4, 0) then the mobile station is a foreign SID roamer because SID 4 is not in the list.

IS-95 (Ex. 1020) at 6-138–6-139.

106. Furthermore, much as in IS-136, IS-95 provided for "the network to supply information that may be displayed by the mobile station." *Id.* at 7-173.

7.7.5.1 Display

This information record allows the network to supply display information that may be displayed by the mobile station. The base station shall use the following variable-length format for the type-specific fields:

Type-Specific Field	Length (bits)
One or more occurrences of the following field:	
CHARi	8

> CHARi - Character.
>
> The base station shall include one occurrence of this field for each character to be displayed. The base station shall set each occurrence of this field to the ASCII representation corresponding to the character entered, as specified in ANSI X3.4, with the most significant bit set to '0'.

107. It is apparent from the above that the IS-95 cellular system provided for the ability to (i) scan and receive a pair of Mobile Country Code and Mobile Network Code, (ii) define a home network, (SID_p), (iii) give preference to a home network over non-home networks, (iv) compare the received SID (SID_r) to the home network SID (SID_p), (v) define a plurality of networks as being home networks, and (vi) display information as defined by the network provider.

108. As discussed above, IS-95 was developed with the requirement of being backwards compatible with AMPS. Thus, it is not surprising that in IS-95 the network signaling was also provided by IS-41.

5. GSM

109. While in the late 1970s into the early 1980s AMPS was being successfully deployed across the entire USA, a different situation prevailed in Europe. The fact that the same system was deployed in the entire country meant that a user whose home network was in any location in the USA could use his/her phone anywhere in the USA. This gave AMPS a fundamental advantage and was a significant contributing force to its widespread success.

110. On the other hand, in Europe, there were several analog systems used in different countries or regions. Each of them was an analog system, and they all were similar to each other, as they were similar to AMPS. However, "similar" does not mean compatible. The differences were sufficient to prevent cross-region usage. So, a German subscriber could not use his/her mobile phone in neighboring Netherlands to the west or Denmark to the north.

111. Much as in the USA we realized that there was enough demand to move to a more efficient digital system, so did the Europeans. Ironically, the significant disadvantage of having multiple, incompatible analog systems present in Europe proved to be a significant advantage. Any attempt to design a digital system that would be compatible with all of the then-existing analog systems in Europe was doomed on its face. So, the decision was made to move to a brand new digital system, designed from the ground up with no constraints of backwards compatibility to anything. A technical group was convened, conveniently named Groupe Spécial Mobile,[6] or GSM for short. The standard that was developed by this technical group became known as the "GSM Standard," or just "GSM." In 1988, the continued

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[6] The then existing "formal" language within the standardization body was French. Thus the name is a French name, but its meaning is quite apparent to English-speakers.

development of the GSM Standard was transferred to the then newly created European Telecommunications Standards Institute (ETSI), and among other changes, English was adopted as the formal working language. By that time, deployments of GSM had reached far beyond Europe, indicating its global acceptance. A new name was needed; a name fitting the widely recognized initials was "invented": Global System for Mobile communications, which is what "GSM" stands for today.

112. GSM is a TDMA system, in some ways analogous to the USA-developed IS-54 system. However, it was far superior to it. Recall that IS-136 was developed to "mimic" the capabilities of GSM, as IS-54 was far inferior to GSM. The attempt to keep the USA-developed TDMA system "alive" failed. GSM was simply far too superior.

113. The '933 patent, however, is not relevant to any of these advantages of GSM over IS-54/IS-136, or even over AMPS, save arguably one: GSM introduced the notion of a Subscriber Identity Module, or SIM card, discussed in more detail below in Section VI.B.1. By doing so, GSM "divorced" the user from the device itself. Thus, unlike in the USA-developed systems of the time, a user could remove the SIM card from one phone (device) and insert it into a different device and that different device was now "his/her" device, in the sense that all the information

related to the user was present in the second device by virtue of the fact that the SIM card was in it.

114. The presence of the SIM card allowed new degrees of freedom as to what information was stored where: any piece of information could, in principle, be stored on the SIM card or on the phone itself. The GSM standard provides specific direction as to what information must be stored on the SIM card, what information may be stored on the SIM card, and what information can be stored optionally in either the SIM card or the phone itself.

115. The ’933 patent recognizes that both SIM cards and their usage in a GSM network were well known. *See* ’933 patent (Ex. 1001) at 1:33-53, 2:8-13, 4:61-66. Much as I discussed above in the context of IS-54/IS-136 and of IS-95, the ’933 patent is not related to how information is transmitted to/from the base station, but what information is stored in the mobile device (SIM or the device itself) and what information is displayed to the device’s user.

116. The claims, however, do use language that was specifically developed in the GSM standard, *e.g.*, Mobile Country Code (MCC), Mobile Network Code (MNC) and Home Public Land Mobile Network (HPLMN). These names were known prior to the earliest priority date of the ’933 patent and cannot be considered inventive. In any case, the notions conveyed by these names were known by different names even as far back as the AMPS system, as discussed above in

Section VI.A.2. For example, MCC and MNC (together) in GSM make up the "PLMN," and are equivalent to the SID in AMPS and related standards. The relevance of GSM will be further discussed in subsection 7 and 8 where I discuss UMTS and LTE respectively.

117. As development of what became UMTS was starting, it was named "3rd Generation" ("3G") system, which was yet to be developed. As a result, the industry, retroactively, referred to GSM as a "2nd Generation" ("2G") system. Since IS-95 was also a successful system, offering similar capabilities to GSM, it has also been referred to as another "2nd Generation" or "2G" system. Effectively, then, by default, AMPS has been referred to as a "1st Generation" ("1G") system. These references to "1G," "2G," 3G," and later "4G" (and nowadays "5G" and "6G") are informal, and I only mention them here for context.

118. As far as the signaling protocol is concerned, and the associated WIN functionality, GSM took a radically different path than was taken in North America. Signaling System 7 (SS7) was the widely used signaling/intelligent networking used in fixed telephony world-wide. GSM adopted (and expanded) SS7 for the GSM networks. In other words, a GSM Mobile Switching Center (MSC) appeared to the rest of the world as just another switch in the large, world-wide network of switches (that existed independently of mobile communications). Thus the Frankfurt MSC that belong to a German GSM operator could "talk" with a fixed telephony switch

anywhere in the world, making international connectivity a much simpler process than was necessitated by IS-41. SS7 was at some point in time the largest packet switched data communications network in the world. It is also a first "phase" of WIN.

6. GPRS and EDGE

119. GSM was a voice-centric system. The capability to transmit data was present as well, but the main focus in the development process was the ability to make and receive ordinary, traditional voice calls. Data was seen as a side, added benefit. The international technical community quickly realized that supporting data communication was an important and fast-growing need. Thus, as part of the ongoing improvement of GSM, a set of new capabilities was introduced into GSM, called General Packet Radio Service (GPRS). It provided for packet switching (as opposed to the traditional circuit switching of GSM), which is much more suitable for the transmission of data.

120. The introduction of packet switching and GPRS specifically did not imply any changes to the existing GSM system as it relates to the '933 patent. In other words, the process of identifying the network to which a base station belongs, the process of selecting a network by the mobile device, and what the mobile device displays after the selection is made is in no way impacted by the presence, or the absence, of GPRS in a GSM network.

121. However, GPRS also introduced a new set of capabilities in the infrastructure portion of the GSM network. The introduction of packet switching over the air interface was a very significant step forward. However, new capabilities in the network signaling were also introduced. In particular, SS7 was supplemented to operate in conjunction with an Internet Protocol (IP) solution. Thus, the various network elements of a GSM network could communicate with each other either using (the by-then conventional) SS7 protocol, or by using an all-IP approach.

122. By 2003 it was understood that GPRS offered the capability of mobile devices to be data communication devices by which they could access Internet-based data. For example, the book "GSM, GPRS and EDGE Performance" explains: "The first two phases of GSM provided a solid basis for the GSM system evolution towards the third-generation (3G) system requirements and items, which were, at the beginning of the work, better known as Phase 2+ items. In the core network (CN) side, the evolution led to the introduction of general packet radio system (GPRS) network architecture, especially designed for Internet connectivity." Ex. 1021 at 4.

123. The book further explains: "While the current GSM system was originally designed with an emphasis on voice sessions, the main objective of the GPRS is to offer an access to standard data networks such as transport control protocol (TCP)/Internet protocol (IP) and X.25." *Id.* at 15; *see also id.* at 14 ("The GPRS system brings the packet-switched bearer services to the existing GSM

system."), 49 (referring to GPRS as "the packet-switched data service of GSM"), 14-47. In short, IP-based wireless communications systems were well known and developed at least within the context of wireless communications and GPRS in particular.

124. GPRS represents a significant step in the direction of providing efficient means for data communications in that it introduced packet switching in the air interface as well as IP in the network infrastructure portion of a GSM network. But it was only one step and it was quickly realized that significant improvements were needed. Because GPRS was an enhancement of GSM, the next development became known as Enhanced Data Rates for GSM Evolution, or EDGE. EDGE has also been referred to as EGPRS, or Enhanced GPRS for obvious reasons.

125. In light of UMTS, discussed in the next subsection, which has been referred to as "3G," GPRS/EDGE are often referred to as "2.5G," as they are measurably more capable than GSM ("2G") but also measurably less capable than the then-new UMTS, 3G, system.

7. UMTS and 3GPP

126. By the late 1990s, it was undeniable that IS-95 proved that an air interface based on CDMA was very viable. It was equally undeniable that GSM had developed the necessary networking protocols that were second to none. In a somewhat unusual, but entirely rational and thus not unexpected way, the world

converged in “marrying” the best aspects of GSM with the best aspects of IS-95 to create the first “3G” system that would be a world-wide system. Thus, while the air interface was based on principles of CDMA developed in the context of IS-95, the core network, including signaling control, used the existing GSM/GPRS capabilities, including the IP-based wireless communication networking.

127. As part of that effort, a new organization was formed, called the “3rd Generation Partnership Project,” or “3GPP,” in order to develop a new standard which became known as UMTS, Universal Mobile Telecommunications System.

128. Even though 3GPP, formally, is not a standards-setting organization, from a practical perspective it is. It develops Technical Specifications that are then typically adopted by the respective standards-setting bodies of a given country/region. At the core of 3GPP’s organization lies the seven “Organizational Partners,” each of which is a Standards Setting Organization (SSO) in a specific country.[7]

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[7] In the case of ETSI, it is Europe that ETSI represents, so it is not quite “one country,” but by virtue of many countries in Europe accepting ETSI standards as the national standard, in the interest of simplicity, we refer to each Organizational Member as representing “a country.”

129. The seven organizations and their respective standards setting country/region are:

1. The Association of Radio Industries and Businesses, or ARIB (Japan);
2. The Alliance for Telecommunications Industry Solutions, or ATIS (USA);
3. China Communications Standards Association, or CCSA (China);
4. The European Telecommunications Standards Institute, or ETSI (Europe);
5. Telecommunications Standards Development Society, or TSDSI (India);
6. Telecommunications Technology Association, or TTA (Korea); and
7. Telecommunication Technology Committee, or TTC (Japan).

130. 3GPP works using a model similar to one that had been used earlier by ETSI. There is a hierarchical structure within each of a number of Working Groups (WG) being the source of technical contributions, some of which ultimately mature into Technical Specifications. In addition, several WGs are part of a given Technical Specification Group, or TSG. There are several Technical Specification Groups (TSGs), each one of them having a number of Working Groups and covering technical subject matter that is defined and follows a logical, hierarchical structure.

131. The Working Groups are made up of individuals who work in any company that is a member of at least one of the Organizational Partners. Technical contributions, in the form a Technical Document (TDoc) are presented at regularly scheduled (and sometimes ad hoc) meetings of a given WG. Deliberations take place, contributions are analyzed, and consensus typically emerges, leading to a Technical Specification. Said Technical Specifications can and are often amended to correct prior errors, clarify prior language, introduce new features, or delete previously agreed upon features. It is up to each Organizational Partner to accept the TS as a standard.

132. Any one TS is assigned a version number. For example, TS 25.211 is a TS that covers one specific broad topic area in UMTS. It has several version numbers such as 6.0.0, 8.4.5, 12.0.0, etc. The first value in such three-field value (6, 8, and 12 in the example) corresponds to the "Release." Roughly speaking, the second value (0, 4, and 0, respectively in the example above) is a representation of the evolutionary process within a given release (as shown by the first number). Lastly, the third number in this three-number format represents minor typographical or stylistic changes to the given standard. Thus version 9.4.6 of a given TS can be expected to have minor corrections to version 9.4.5 of the same TS.

133. New releases introduce new functionality because standards are constantly evolving. Thus, Release 12 will have new functionalities and capabilities

that Release 11 did not; Release 11, in turn will have new functionalities and capabilities that Release 10 did not have and so on.

134. Both the Technical Documents (TDoc) that are submitted by the WG members and the Technical Specifications (TS) that are created are publicly available on 3GPP's web site. In other words, as part of the ongoing standardization process, new documents and new technical specifications are routinely uploaded to the appropriate location of the 3GPP web site and are available for anyone to examine.

135. As an example, a portion of the page displayed at https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=467 is shown below:

3GPP A GLOBAL INITIATIVE Portal

General | Versions | Responsibility | Related

Specification #: 25.211

Reference: 25.211
Title: Physical channels and mapping of transport channels onto physical channels (FDD)
Status: Under change control CR
Type: Technical specification (TS)
Initial planned Release: Release 1999
Internal: ☐
Common IMS Specification: ☐
Radio technology: ☐ 2G ☑ 3G ☐ LTE ☐ 5G

Click to see all versions of this specification

Remarks (1)

Creation date	Author	Remark
2017-07-04 10:46 UTC	John M Meredith	Txferred from RAN1 to RAN6.

History

Action date	Action	Author
2017-07-04 10:56 UTC	Txferred from RAN1 to RAN6.	John M Meredith

Exit

136. The page shown above, which corresponds to the Tab "General" provides general information about the document TS 25.211. The Tabs "Version," "Responsibility," and "Related" provide additional information. Most relevant is the Tab "Version," which, upon being selected, provides the following exemplary information, including "Meetings," "Version," and "Upload Date." The list of versions is long, so I show only an excerpt below.

3GPP Portal

General | Versions | Responsibility | Related

Specification #: 25.211

Release 5(Spec is UCC for this Release) **Latest Remark:**

Meetings	Version	Upload date	Comment
RAN#30	5.8.0	2005-12-15	
RAN#28	5.7.0	2005-06-21	
RAN#25	5.6.0	2004-09-28	
RAN#21	5.5.0	2003-09-29	
RAN#20	5.4.0	2003-06-27	
RAN-#18	5.3.0	2003-01-07	
RAN-#17	5.2.0	2002-09-27	
RAN-#16	5.1.0	2002-06-28	
RAN-#15	5.0.0	2002-03-29	

Release 4(Spec is UCC for this Release) **Latest Remark:**

Meetings	Version	Upload date	Comment
RAN-#17	4.6.0	2002-09-27	
RAN-#16	4.5.0	2002-06-28	
RAN-#15	4.4.0	2002-03-29	
RAN-#14	4.3.0	2002-01-09	
RAN-#13	4.2.0	2001-10-08	
RAN-#12	4.1.0	2001-06-28	

Exit

137. As one can see, for each version there is a "Meeting" number which is the meeting at which the version was finalized, and an "Upload date" which is the date the TS was uploaded.

138. By simply clicking on a given version number, one can download the respective document. Furthermore, one can look at the meeting minutes (both of the meeting in which the TS was finalized and of previous meetings) to see the historical development of any particular aspect of the TS. Said meeting minutes and related

TDocs are also organized in a similar chronological fashion by the TSG and WG within the TSG.

139. As it relates to the ’933 patent, the most relevant TSs are discussed below in Section IX.B where I present a detailed analysis of the grounds of invalidity of the ’933 patent based on the 3GPP Standards.

140. I also note that soon after its establishment, 3GPP “adopted” the further enhancements and maintenance of the GSM standard as well.

8. LTE

141. While 3GPP is continuing further enhancements to UMTS and to GSM, it also undertook the development of the next generation (thus “4G”) of wireless cellular systems, commonly referred to as Long Term Evolution, or LTE.

142. The air interface, *i.e.*, how information is transmitted, has been changed once again. Therein CDMA was a big step forward (relative to TDMA), LTE introduced a yet more efficient technique into the wireless cellular systems, called Orthogonal Frequency Division Multiple Access, or OFDMA. The specifics of OFDMA, while important, are not relevant to the ’933 patent. Indeed, because a detailed discussion of LTE is not particularly relevant to the validity of the ’933 patent, I do not include it here.

143. I will describe the relevance of UMTS/GSM in further detail in Sections VI.B and VI.C in the context of the SIM card and identification of "Access Technologies."

B. Mobile Devices

144. When, in the 1970s, mobile phones/devices were first introduced, they were thought of being devices located within a "mobile," *e.g.*, an automobile, thus enabling communications while being "mobile," *e.g.*, driving. The current interpretation of "my mobile," *i.e.*, a hand-held device came later.

145. One of the first hand-held devices was nick-named a "brick" as it resembled one in size and weight. It was an AMPS phone and cost approximately $4000 at the time. The multi-thousand dollar price tag gave them the reputation that they were devices for "the rich and the famous."

146. A lot has changed since then. The pocket-sized devices of today cost less than $10 at the low end and up to several hundred dollars at the high end. Furthermore, even a $10 dollar phone of today has more capabilities than the $4000 "brick phone" of the 1970s. This has become possible due to a convergence of several factors, including battery technology, memory technology and cost, processor technology and cost, etc.

147. As I often indicated to the thousands engineers that I trained, even back in the 1990s, a GSM phone of, say 1995, had more processing capacity than the first

computer I saw in my computer science class at the University in 1974, which occupied a relatively large room! Even though we refer to them as "mobile phones" (or similar terms), they are really "mobile computers"; indeed, they are special purpose computers, specifically designed and intended to provide a variety of selected capabilities. Mobile communications, as it turns out, is typically just one of them. I will discuss the aspects of today's mobile phones most relevant to the '933 patent in the subsections below.

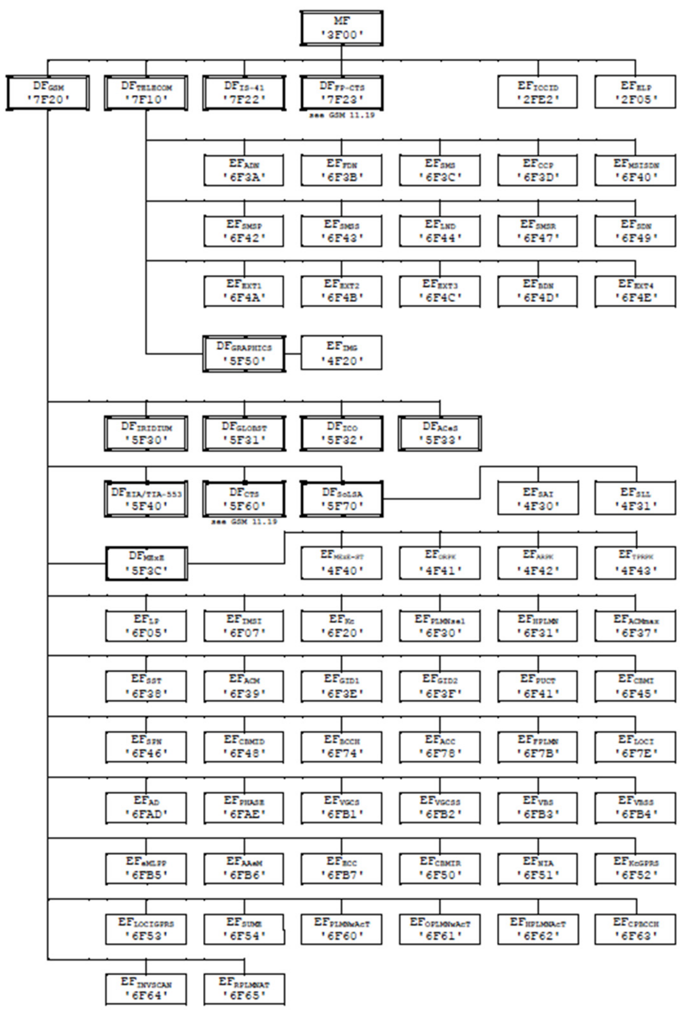
1. SIM Cards in Mobile Devices

148. At a high level and from the perspective of the '933 patent, a mobile phone consists of two major components: (a) the portion of the phone that performs the communication functionality with a base station of the network, and (b) a "smart card" that is present within the mobile phone, referred to as the "Subscriber Identity Module" (or SIM) as the '933 patent recognizes.

149. The SIM card can include a plethora of information, some of which will be discussed herein. For now, it is sufficient to point out that the above architecture, *i.e.*, of a SIM card communicating (internally) with the communications part of the mobile phone was well known by 2003. The GSM system had made quite significant use of the SIM card and, indeed, a lot of what we do today traces its roots to the early days of GSM in the late 1980s into the early 1990s.

150. The GSM standard 11.11 is most relevant. I will use 3GPP TS 11.11 V8.6.0, dated December 2001, to illustrate certain points and refer to it as TS 11.11. *See* Ex. 1022.

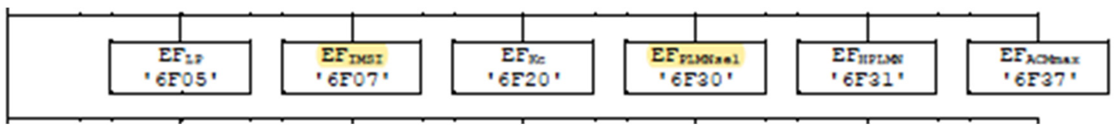
151. The TS 11.11 standard describes what and how information is stored in the SIM card. The information storage follows a logical structure of Files, that may include other files, and ultimately include what are called Elementary Files, or EF. This is shown below:



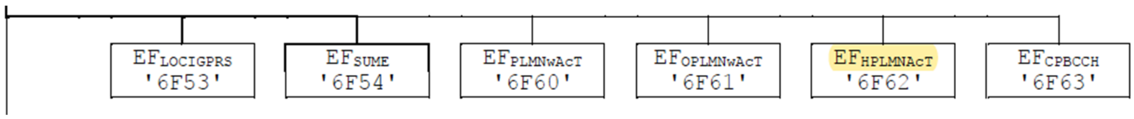
TS 11.11 (Ex. 1022) at 113.

152. Each File has a 4 hex-digit identifier. The Master File, having the Identifier 3F00, is at the "root" of the filing system of the SIM card. The file DF_{GSM}, having the Identifier 7F20, contains, among several other Files, the most relevant EFs as discussed below.

153. Most relevant in this case are the elementary files EF_{IMSI}, $EF_{PLMNsel}$ and $EF_{HPLMNAcT}$, as highlighted in the portions of the above figure shown below:



* * *



TS 11.11 (Ex. 1022) at 113 (annotations added).

154. The Elementary File EF_{IMSI} (having Identifier 6F07) contains the subscribers International Mobile Subscriber Identity (IMSI). The specifics of this EF are shown below:

10.3.2 EF_{IMSI} (IMSI)

This EF contains the International Mobile Subscriber Identity (IMSI).

Identifier: '6F07'	Structure: transparent	Mandatory
File size: 9 bytes	Update activity: low	

Access Conditions:
- READ CHV1
- UPDATE ADM
- INVALIDATE ADM
- REHABILITATE CHV1

Bytes	Description	M/O	Length
1	length of IMSI	M	1 byte
2 - 9	IMSI	M	8 bytes

Id. at 55.

155. The IMSI identifies the subscriber on a global basis and its structure is discussed below in Section VI.C.3.b.

156. The next relevant EF is $EF_{PLMNsel}$ (having Identifier 6F30). It contains at least 8 PLMN codes (which are pairs of MCC/MNC codes) that are preferred PLMNs according to the user or the network operator (*e.g.*, AT&T). The specifics of this EF are shown below:

10.3.4 $EF_{PLMNsel}$ (PLMN selector)

This EF contains the coding for n PLMNs, where n is at least eight. This information determined by the user/operator defines the preferred PLMNs of the user in priority order.

Identifier: '6F30'	Structure: transparent		Optional
File size: 3n (n ≥ 8) bytes		Update activity: low	
Access Conditions: READ CHV1 UPDATE CHV1 INVALIDATE ADM REHABILITATE ADM			
Bytes	**Description**	**M/O**	**Length**
1 - 3	1st PLMN (highest priority)	M	3 bytes
22 - 24	8th PLMN	M	3 bytes
25 - 27	9th PLMN	O	3 bytes
(3n-2)-3n	nth PLMN (lowest priority)	O	3 bytes

- PLMN

  Contents:

  Mobile Country Code (MCC) followed by the Mobile Network Code (MNC).

TS 11.11 (Ex. 1022) at 56. This is a list of PLMNs. When read in the context of the GSM system, one understands that this is a list of non-home networks (a discussion of different EF for the Home PLMNs immediately follows).

157. Finally, the next relevant EF is $EF_{HPLMNwAcT}$ (having Identifier 6F62) and contains the PLMN codes (MCC/MNC pairs) of the respective one or more

Home PLMNs with the respective access technology in a prioritized manner, as shown below:

10.3.37 $EF_{HPLMNwAcT}$ (HPLMN Selector with Access Technology)

The HPLMN Selector with access technology data field shall contain the HPLMN code, or codes together with the respective access technology in priority order (see TS 23.122 [51]).

Identifier: '6F62'	Structure: transparent		Optional
File size: 5n bytes		Update activity: low	
Access Conditions: READ CHV1 UPDATE ADM INVALIDATE ADM REHABILITATE ADM			

Bytes	Description	M/O	Length
1 to 3	1st PLMN (highest priority)	M	3 bytes
4 to 5	1st PLMN Access Technology Identifier	M	2 bytes
6 to 8	2nd PLMN	O	3 bytes
9 to 10	2nd PLMN Access Technology Identifier	O	2 bytes
:	:		
(5n-4) to (5n-2)	Nth PLMN (lowest priority)	O	3 bytes
(5n-1) to 5n	Nth PLMN Access Technology Identifier	O	2 bytes

- PLMN
  Contents:
    Mobile Country Code (MCC) followed by the Mobile Network Code (MNC).
  Coding:
    according to TS 24.008 [47].

- Access Technology

  Contents: The Access Technology of the HPLMN that the MS will assume when searching for the HPLMN, in priority order. The first Access Technology in the list has the highest priority.

TS 11.11 (Ex. 1022) at 84-85. This is clearly a list of home PLMNs that also includes which "Access Technology" is relevant. "Access Technology" refers to, *e.g.*, GSM, UMTS, LTE, etc., as I describe above.

158. In short, the SIM card disclosed in the 2001 version of the TS 11.11 standard stores both a list of a plurality of home network PLMNs as well as a list of a plurality of non-home network PLMNs.

2. Memory in Mobile Devices

159. As discussed above, mobile devices were from the beginning of their existence, a form of a special purpose computer. Their functionality and associated computer processing speeds have increased by orders of magnitude, but at the most basic level, they were and continue to be special purpose computers.

160. As such, they contain memory for storing different types of information. That includes at least Read Only Memory (ROM) as well as Random Access Memory (RAM). In addition, as discussed above, the SIM card provides additional non-volatile memory for storing various user-specific types of information.

161. Today's mobile devices, as well as those in the 2003 timeframe, have varying amount of memory; in fact, the amount of memory is a differentiating feature for some phone models. While most people think of memory as used for storing photos or music and the like, memory is also used for storing the device's operating system (typically the ROM type) but also for storing values for various operational variables, *e.g.*, the frequency of recently successfully used control channels, which can be used to help in the search for available control channels as I will discuss in Section VI.C.3 below. Other examples include Contact Lists (*i.e.*, names, phone number, and other information related to one's "contacts"), which typically can be stored on either the SIM card or the device itself, or in both places

as per the user's choice. Thus, having memory in the mobile device and storing whatever information one chooses to store in it has been known and used ever since the beginning of mobile communications, certainly by GSM in the early 1990s and, obviously, by September 2003, the earliest claimed priority of the '933 patent.

3. Computer Instructions on Mobile Devices

162. Much as the memory costs have decreased and thus associated increase in memory usage in mobile devices has increased, so has processing capacity. Mobile devices, being special purpose computers, have always had computer instructions, *i.e.*, computer programs that control the operation of the device.

163. In any mobile device using digital communications one would expect to find at least one special purpose processor, each with its own set of computer code, *i.e.*, computer instructions, to perform the tasks it is designed to perform. Thus, both memory, as discussed above, and computer instructions are inherently present in any mobile device to enable to operation of the at least one processor in the mobile device.

4. Displays on Mobile Devices

164. Just as memory and processing capacity have been increasing over the years, so has the ability of the device to interact with the user via a visual display. While the touch screen user interface is relatively new, even the oldest phones had

some display that showed some of the most desirable information. As the screen sizes grew, so did the information that might be displayed at any one time.

165. Some of the most common (and oldest) pieces of information that have been displayed are: (i) date and time; (ii) and indication of the received signal strength (the "number of bars" one has); (iii) information about the network that the device is prepared to use; and (iv) the battery level. While the above have been the most commonly available information to most users, there is a plethora of information that can also be available, either in general or in specific instances.

166. The capability to display such information has existed in mobile communications systems at least since the development of GSM in the late 1980s and into the early 1990s.

C. Scanning and Selecting a Network

167. A critical condition for the wide-spread adoption of a new technology is that the new technology **appears** simple to the broad public. Typically, the more complicated the technology is, the simpler it is perceived by the general public. In short, the complexity is hidden away from the public.

168. A classic example is the ordinary telephone vis-à-vis the TV remote control. Most people perceive the former as being simple "you just pick it up and dial your number" is what my mother used to say, whereas she never managed to use the remote control on the TV—it was just too complicated. In fact, the world-

wide telephone network entails far more complexity than even the most sophisticated TV remote control.

169. In much the same way, the intent of the mobile communications industry was to make the mobile phone appear to be as simple as possible. However, even a moment's reflection shows that the problem is more complicated than meets the eye. For example, if I travel from my home to the other side of town, how does the system know where I am so that it delivers the call to me? What if I travel even further, say to Frankfurt, Germany? How does the German mobile network know who I am, so that it can offer me the service and bill me appropriately? If a friend calls me (who does not even know where I am at the time), how does the system route the call to my location in Frankfurt so that my phone can "ring" and I can answer and talk with the caller? It is once again apparent that, at a minimum, each cell must somehow provide an indication as to which network it is a part of. This is the subject of the next subsection and related issues are covered in the subsections that follow.

1. Network Identifiers

170. As I discussed above in Section VI.A, not surprisingly, even the oldest cellular system provided for each cell to identify the network that it belonged to. This is SID1, which is contained in Word 1 of the SYSTEM PARAMETER OVERHEAD MESSAGE, as shown below:

3.7.1.2.1 SYSTEM PARAMETER OVERHEAD MESSAGE

The system parameter overhead message consists of two words.

Word 1

T_1T_2 = 11	DCC	SID1	RSVD = 000	NAWC	OHD = 110	P
2	2	14	3	4	3	12

EIA/TIA-553 (Ex. 1016) at 3-14 (emphasis added).

171. As discussed in Section VI.A.2 above, the two most significant bits of SID1 are a Country Code and the remaining bits identify the specific network within said country.

172. As I discussed in Section VI.A.3, IS-54/IS-136 also provided for the same network identification. Furthermore, IS-136 provided for a MCC (Mobile Country Code). For example, Section 6.4.1.1.1 describes several "Mandatory F-BCCH Messages." IS-136.1 (Ex. 1018) at 150. One such message is "System Identity." *Id.* at 153 (Section 6.4.1.1.1.5). In the same message, there is (a) a SID (defined in Section 8.3.1, nothing new); (b) an MCC (defined in Section 8.3.3 and also see below); and (c) an "Alphanumeric System ID."

173. Section 6.5 provides additional information regarding each Information Element (IE), in alphabetical order. One of those IEs is the "Mobile Country Code." IS-136.1 (Ex. 1018) at 214-215. The System Identification (SID) is also addressed. *Id.* at 240; *see also* IS-136.2 (Ex. 1019) at Sections 2.3.8, 2.3.9 & 2.3.10.

174. The purpose of the "Alphanumeric System ID," as explained in IS-136.1, "is to supply an alphanumeric system ID to each user"—*i.e.*, display a network name. *Id.* at 189. It is what is displayed on the mobile device as far as what the "System ID" is. Notably, more than one SID can have the same Alphanumeric System ID.

175. Furthermore, as discussed in Section VI.A.4, IS-95 provided for additional capabilities with respect to identifying networks. Specifically, in addition to the SID as used in IS-54/IS-136, it added a Network Identification (NID) field. Thus, "a network is uniquely identified by the pair (SID, NID)." IS-95 (Ex. 1020) at 6-138.

176. As discussed above, the SID includes a Country code identifier, *i.e.*, it is at least a "Mobile Country Code" (MCC) as would be understood by a POSITA reading the '933 patent. Similarly, the NID is a Mobile Network Code (MNC) as used in the '933 patent.

177. The specific terminology of a PLMN identifier, made up of an MCC code plus an MNC code, was used by the developers of the GSM standard. The '933 patent recognizes as much in the Background section. *See, e.g.*, '933 patent (Ex. 1001) at 1:34-45. As mentioned above in Section VI.A.6, GPRS/EDGE were developed as enhancements to GSM. Thus, the MCC/MNC network identifiers in GPRS/EDGE are the same as they were in GSM.

178. In Section VI.A.7 above, I discussed how UMTS was a successful "marriage" of the GSM networking standards and the IS-95 spread-spectrum techniques for the air interface. Thus, it is no surprise that the networking aspects as they relate to network identification used in GSM (MCC/MNC pairs) were also used by the developers of UMTS, *i.e.*, the 3GPP.

179. In short, there is a common thread starting with the oldest wireless cellular technologies: they all have used a network identifier to identify the network that each cell belongs to. Said identifiers typically consisted of identifying (a) a country in which the network operated, and (b) a network within said country. The names have changed over time and so have the details of how this is done, but the principle remains the same.

2. Location Areas and Location Area Code (LAC)

180. The need for a network identifier used by a base station to identify the network it is part of is apparent even to a person of less than ordinary skill. The desirability of a Location Area Code is less apparent to the ordinary person, but well known to a person of ordinary skill in the art.

181. However, it does not take much to see, by an ordinary person, why a location area identifier of some sort is desirable in most cases. Indeed, the notion of a Location Area Code (LAC) as used in the '933 patent was used in GSM.

182. The need, or at least the desirability of a LAC, is made clear by considering a very simple question/example: If my sister (who lives in Athens, Greece) calls my mobile number, how will the mobile communications network find me/my mobile in order to notify me that there is an incoming call? Obviously, my sister knows my phone number; we can assume it is +1-703-555-1234. There is no "+" in the numbering system. However, GSM "invented" using the "+" as a proxy for the local (where the call is being placed) international access code. So, for example, when calling from the USA, the international access code is 011, so the "+" corresponds to 011—in the USA (and can be omitted if the call is made in the USA and the destination is also the USA). In Greece (and many other countries) the international access code is 00, so the "+" corresponds to 00 in Greece, so my sister actually would call 00-1-703-555-1234. The network in Greece would recognize that the call is intended for an international destination (by virtue of the 00) and in particular for the USA, as "1" is the international code for the USA (independent of and predating mobile communications). Once the call is routed to the USA, the 703 indicates that it should be routed to Northern Virginia, and then the specific number is reached. All of that worked fine in fixed telephony. But, while my number is a "Northern Virginia, USA" number, I may be physically anywhere in the world. How will the call be routed to where I am?

183. A quick proposed answer might be that my phone registers at each cell that it finds as being its "serving cell." In the next subsection I will discuss how the mobile scans and selects a cell, and in Subsection 4, I will discuss the related network selection. For now, we can assume that, for example, I have landed in San Francisco, went to the car rental location, picked up a car, and drove south to San Jose, CA. In doing so, I may have been in many cells, as an example we can assume it was 20 cells. Since I never know ahead of time when a call to me might come, in principle my phone would need to perform a "location area update" each time I got into a new cell, *i.e.*, 20 times in the above example. A "location area update" is precisely what the words suggest: my phone, unbeknownst to me, determines that it is in cell X and notifies the "San Francisco network" (which cell X belongs to) that it is there. Said network then, recognizing that my phone is a "Northern VA area" phone informs the "Northern VA" network that I am there. Thus when a call arrives to it, say the one that my sister was making, the "Northern VA" network routes the call to the "San Francisco" network which routes it to cell X. While that approach would work it is suboptimal for a very simple reason: even if I receive no calls (thus no revenue to AT&T, my network provider), a large amount of network resources are used in order to simply keep track of where I am so that calls can be routed to me in case I do receive one.

184. A much better solution is present in most systems, certainly since the inception of GSM. It is implemented via the notion of a Location Area. A number of cells are grouped into one Location Area (LA), identified by a Location Area Code (LAC). How many and which ones are in any one LA is a design parameter for the network operator, *e.g.*, for AT&T.

185. Rather than sending a Location Area update every time a new cell boundary is crossed, it is done only when LA boundaries are crossed. Thus, for example, in my hypothetical drive from the San Francisco airport to San Jose, the 20 cells might be grouped into 3 Location Areas, thus significantly reducing the number of location area updates. Of course, this implies that every time a call comes in for me, *all* cells in the LA in which I am known to be will page my phone. Normally, my phone will receive the page of the one base station to which it is listening for pages, will respond to it, and all progresses from there on.

186. There is an optimization balancing act that the network provider must perform: "large" location areas (*i.e.*, consisting of many cells) cut down on the amount of updating that is necessary (and associated resources used for doing the updating); on the other hand, it increases the necessary resources of performing the paging function in order to find the cell in which the mobile device is currently located. By contrast, "small" location areas (*i.e.*, consisting of a small number of

cells) have the exact opposite effect. Therein lies the optimization issue for network operators.

187. From the mobile device's perspective, as long as a cell that is capable of serving it exists in the same LA as the one that the mobile has been in, there is no need to change cells and to perform a location area update.[8] If no such cell exists, then the new cell is selected, belonging to a new LA, and a location area update is performed using the newly identified LAC.

188. I also note that the triplet MCC/MNC+LAC has sometimes been referred to as the Location Area Identifier (LAI), as it indeed defines the location of the mobile device to the level of granularity of a Location Area. *See* Hicks (Ex. 1006) at 2:32-34 ("The PLMN data is a composite of an MCC-MNC identifier. The LAI information is a composite of the PLMN data and an LAC (Location Area Code) identifier.").

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[8] Periodic LA updates are also used in some systems, wherein a mobile performs an update even if there is no change in the LA if a certain amount of time has elapsed and the mobile has had no interaction with the system. They can be thought of as "I am still here" messages to the network. Such updates are not relevant to the '933 patent.

189. As I discuss in Section VI.C.3 below, using the MCC, the MNC, and the LAC in making the decision as to which cell to use was a well-known aspect of GSM technology, dating back to at least the 1990s. *See, e.g.*, GSM System Engineering (Ex. 1023) at 29-32, 125-126.

3. Process of Scanning and Selecting a Cell

190. Within the notion of selecting a particular wireless communication network by a mobile device is embedded the notion of "camping" on a cell. The term "to camp" (and its derivative terms such as camped, camping, etc.) is used to indicate which cell a mobile device has selected to (a) listen to for the possibility of being paged and/or (b) transmit to requesting communication resources should the user want to communicate, *e.g.*, make a phone call, send an email, etc. Of course, the selection of said cell inherently implies that the network to which the cell belongs to is also being selected.

191. The process of scanning and selecting a cell, *i.e.*, of "camping" consists of two major and considerations: (1) radio considerations and (2) network selection considerations. These are quite independent considerations, thus I discuss them in each of the following two subsections.

a. Radio Considerations

192. The term “radio considerations” has been used to describe the consideration related to having a good (or at least acceptable) connection over the air (*i.e.*, “wireless”) between the mobile device and the selected cell.

193. Even as far back as AMPS the concept was known and used. The term “best server” was widely adopted in the AMPS days. The concept was simple: from among all nearby cells, pick the one that is the “best.” Two important points need to be made regarding AMPS. First, each one of System A and System B had 21 predefined channels that were control channels. Thus scanning all 21 control channels for the preferred system (A or B) was not an overwhelming task, as they were predefined, *i.e.*, known to all the mobile devices anywhere. If none were acceptable, scanning the 21 control channels of the other system was also not impractical. Second, the measure of “good” was simple: signal strength was considered to be the unique measure by which a given cell’s control channel was evaluated. Thus, it follows, that when evaluating system A, the “best server” was the cell that had the strongest control channel among the set of 21.

194. If evaluating the two strongest control channels of the preferred system did not result in success, the control channels of the second system would be scanned. In other words, the home system (System A or System B) would be prioritized over the non-home system.

195. As the systems got more complex, *e.g.*, with IS-136 and/or with GSM, this became a larger problem. For example, in GSM no channels were predefined as control channels and there was no specific number of channels that could be control channels. That provided the network operator a great degree of flexibility as to how many and which channels to make control channels. However, a mobile device would, in principle, have to consider all of the channels, decide whether or not it was a control channel and then evaluate how good it was. Also, in a digital system, signal strength is not the only measure of "goodness." There are other measures, making the definition of "best" a difficult one. Therefore, in GSM, there are two measures (originally there was only one) that, when met, identify the cell as an "acceptable" cell. Otherwise it is not acceptable. In short, rather than looking for the "best cell" one is looking for cell that is "good enough," *i.e.*, one that meets the radio requirements that have been set.[9]

196. Once a cell that meets the radio requirements is found, it needs to be evaluated vis-à-vis the network to which it belongs. I should note that as part of

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[9] There are some options within the GSM standard to identify a plurality of acceptable cells, from the radio consideration perspective, and making the selection based on certain radio-related aspects. This, however, is not relevant to the '933 patent.

evaluating whether or not the radio requirements are met, the mobile device receives relevant radio-related control information from a candidate cell. In addition to receiving said radio-related relevant information, the candidate cell transmits, and the mobile receives, the MCC and the MNC of the network to which the cell belongs as well as the LAC of the LA which the cell is part of. In other words, the LAI is sent and available to the mobile device making the camping decision.

b. Network Selection Considerations

197. In order to better understand the process by which such selection is performed, one needs to consider the network architecture in a little more detail.

198. The specifics of a network architecture depend on the particular technology, *e.g.*, AMPS, IS-136, IS-95, GSM, UMTS, or LTE. However, a higher level description is equally valid for any of these technologies. In order to be more precise, I will use the terminology used in GSM, as that has become the de-facto terminology used in the industry, since at least the late 1990s or early 2000s.

199. For the sake of simplicity, I will also use AT&T as a primary paradigm of a network operator to which a given mobile is a subscriber of. The discussion is equally valid if I used any other network, *e.g.*, Verizon, T-Mobile, or Sprint (the four major network in the USA) or other networks around the world, *e.g.*, Vodafone (of the UK but operating globally), Orange (of France, but also operating globally, f.k.a. France Telecom), or Deutsche Telecom (of Germany, operating globally as well).

200. Through a combination of business decisions and regulatory structures, AT&T has obtained licenses to operate in effectively all of the USA. Similarly, for example, Vodafone obtained licenses to operate in effectively all of India. As I mentioned above, I will focus on AT&T and the USA. For both business and regulatory reasons, as well as technical ones, it is practical to divide the USA into a number of regions. From a technical perspective, the cells that will cover the entire USA are too many to be thought of as one set. Thus, they are organized in somewhat of a hierarchical structure.

201. The most relevant aspect of this hierarchy is the concept of an MSC, a Mobile Switching Center. Even though there can be other intermediate levels in the hierarchy, we can ignore them for our purposes. An MSC can be thought of as the central "switch" that provides service in a relatively large geographic area. Thus, for example, the "NYC MSC" may provide service not only to New York City proper but to its broader geographic area, including some large (if not all) portion of New York State, Connecticut, New Jersey, etc. The boundaries of what an MSC will cover are defined by a combination of regulatory rules and business decisions. For the purposes of our discussion, we can consider large geographic areas being covered by an MSC. Thus, for example, one can think of the Eastern USA being covered by (1) the Boston MSC, (2) the NYC MSC, (3) the Philadelphia MSC, (4) the Baltimore/Washington MSC, (5) the Atlanta MSC, and (6) the Miami MSC. Again,

these are not meant to be precise definitions but are meant to convey a sense of how large an area an MSC typically may handle. Thus, all of the cells in the Atlanta geographic area (which is, again, generally broader than just the city of Atlanta or even the State of Georgia) "belong" to the Atlanta MSC.

202. Two of the many components of an MSC is the HLR and the VLR, the Home Location Register and the Visitor Location Register, respectively.[10]

203. When an individual elects to become an AT&T subscriber, AT&T assigns to said individual an International Mobile Subscriber Identity (IMSI) that uniquely identifies this individual in the world. The IMSI consists of 15 digits[11] consisting of the MCC, the MNC, and the MSIN, *i.e.*, the Mobile Country Code and the Mobile Network Code as discussed above and the Mobile Subscriber Identification Number, which is a number that the specific network in the specific

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[10] There can exist more complicated implementations of MSCs vis-à-vis the HLR and the VLR, but they are not relevant to this discussion and we can proceed without loss of generality.

[11] There are special cases where it can be less than 15, but that is irrelevant in this case.

country (*e.g.*, AT&T in the USA) assigns to the specific individual.[12] The assignment of the MSIN is left up to the network and typically it, in conjunction with the MCC/MNC will uniquely identify the MSC to which the individual is "assigned to," *i.e.*, is considered to be his/her "Home MSC."

204. I note that any one country may have more than one MCC (but any one MCC corresponds to one country only) and similarly any one network in a given country may have more than one MNC. So, for example, from publicly available information at www.mcc-mnc.com, one can see that AT&T in the USA uses only one MCC, which is 310 and 8 different Mobile Network Codes:[13]

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[12] This is distinct from the "phone number" and is kept proprietary to the operator. Thus, using the hypothetical example of my phone number being +1-703-555-1234, which is known both to me and to whoever wants to know "my number," the IMSI is not known to even the subscriber; thus I do not know my IMSI. AT&T keeps a "translation table" and converts a called number into the corresponding IMSI.

[13] Note that the "1" in the fifth column indicates that the international access code for "conventional" telephone is "1" as I indicated above in the hypothetical example of my sister calling me at +1-703-555-1234.

310	680	us	United States	1	AT&T Wireless Inc.
310	070	us	United States	1	AT&T Wireless Inc.
310	560	us	United States	1	AT&T Wireless Inc.
310	410	us	United States	1	AT&T Wireless Inc.
310	380	us	United States	1	AT&T Wireless Inc.
310	170	us	United States	1	AT&T Wireless Inc.
310	150	us	United States	1	AT&T Wireless Inc.
310	980	us	United States	1	AT&T Wireless Inc.

205. On the other hand, Verizon in the USA uses both 310 and 311 as MCC and a larger number of MNCs:

311	486	us	United States	1	Verizon Wireless
310	013	us	United States	1	Verizon Wireless
311	281	us	United States	1	Verizon Wireless
311	270	us	United States	1	Verizon Wireless
311	286	us	United States	1	Verizon Wireless
311	480	us	United States	1	Verizon Wireless
311	275	us	United States	1	Verizon Wireless
311	485	us	United States	1	Verizon Wireless
310	012	us	United States	1	Verizon Wireless
311	280	us	United States	1	Verizon Wireless
311	110	us	United States	1	Verizon Wireless
311	285	us	United States	1	Verizon Wireless
311	390	us	United States	1	Verizon Wireless
311	274	us	United States	1	Verizon Wireless
311	484	us	United States	1	Verizon Wireless
310	010	us	United States	1	Verizon Wireless
311	279	us	United States	1	Verizon Wireless
311	489	us	United States	1	Verizon Wireless
310	910	us	United States	1	Verizon Wireless

311	284	us	United States	1	Verizon Wireless
311	289	us	United States	1	Verizon Wireless
311	273	us	United States	1	Verizon Wireless
311	483	us	United States	1	Verizon Wireless
310	004	us	United States	1	Verizon Wireless
311	278	us	United States	1	Verizon Wireless
311	488	us	United States	1	Verizon Wireless
310	890	us	United States	1	Verizon Wireless
311	283	us	United States	1	Verizon Wireless
311	288	us	United States	1	Verizon Wireless
311	272	us	United States	1	Verizon Wireless
311	482	us	United States	1	Verizon Wireless
311	277	us	United States	1	Verizon Wireless
311	487	us	United States	1	Verizon Wireless
310	590	us	United States	1	Verizon Wireless
311	282	us	United States	1	Verizon Wireless
311	271	us	United States	1	Verizon Wireless
311	287	us	United States	1	Verizon Wireless
311	481	us	United States	1	Verizon Wireless
311	276	us	United States	1	Verizon Wireless

206. Much like it is up to AT&T to decide which AT&T subscriber is assigned to which AT&T MSC (having a particular AT&T MCC/MNC), it is up to Verizon to decide which Verizon subscriber is assigned to which Verizon MSC (having a particular Verizon MCC/MNC).

207. Each HLR in a given MSC "keeps track" of the subscribers assigned to it. "Keeps track" in this context is not trivial. For example, security information (such as encryption and authentication keys and the like), billing information, etc., are all part of the information that is contained in the HLR database in connection with the given subscriber. The information most relevant in this case is the information about the LAC in which the subscriber last registered, as discussed above in Section VI.C.2.

208. In a manner analogous to the HLR, the VLR is a database that keeps, temporarily, information about mobiles "visiting" the given MSC.

209. Continuing with the hypothetical example discussed above at Paragraph 169, assuming that I travel to Frankfurt, what will happen? Since I am an AT&T subscriber, AT&T has made one of the MCC/MNC codes that "belong" to AT&T be "my" MCC/MNC. Without loss of generality, we can assume that my MCC/MNC is 310+410, *i.e.*, AT&T has made my home MSC be one that is part of the 310+410 MCC/MNC. I will call this MSC the "NVA MSC," as I am located in Northern Virginia.[14] Given that I am a subscriber to AT&T USA, upon identifying myself to the Frankfurt cell, which is part of a "Frankfurt MSC" (which I will refer to as the "FR MSC") that I want to be "camped" on it, it will see my IMSI, which contains the MCC/MNC+MSIN. Thus, the FR MSC will know that it needs to route a message to the 310+410 network, *i.e.*, the AT&T USA network "410." AT&T, in turn, will know that this particular MSIN is assigned to the NVA MSC and will route the message to it. The NVA MSC will communicate with the FR MSC and will relay the appropriate information about me to it. The FR MSC will, in turn, create an entry in its VLR (clearly, I am a "visitor" in the FR MSC) with my information and keep it until it is no longer relevant because, for example, I have left Germany. Similarly,

[14] Clearly, I am not suggesting that this is the name of the MSC that AT&T uses.

the HLR in the NVA MSC will create an entry associated with me indicating that I am located in the FR MSC. Furthermore, as I may cross into new Location Areas within the FR MSC, a "Location Area Update" will be performed whereby my mobile device will get connected to the FR MSC and inform it of my new LAC. This information will be used for any future incoming call to me by the FR MSC.

210. If I start driving from Frankfurt to, say, Amsterdam, sooner or later I will no longer be within the area served by the FR MSC. As I cross into a Location Area that is part of another MSC (which may or may not be still in Germany), the new MSC, call it NEW MSC, will perform the analogous functions with the NVA MSC that the FR MSC did. The NVA MSC will now know and direct any call that is intended for me to the NEW MSC. The NEW MSC will also keep track of my LAC within it and update it as I cross LA boundaries and perform LA updates within the NEW MSC's coverage area. The NVA MSC may also, optionally, inform the FR MSC that I am no longer there, so that the FR MSC can delete my entry in its VLR.

211. The above process is virtually identical if rather than Frankfurt and Amsterdam I were to be in Chicago and drive to Kansas City, or any other place in the USA, or for that matter, in the world.

212. It is apparent that (a) changing the Location Area entails some additional communication between the mobile and the network as well as additional

signaling in the network to make the appropriate LA updates. Thus, it is preferable to remain camped on a cell that is in the same LA as I have been; and (b) that changing MSCs entails a fair amount of signaling between the relevant MSCs, so given a choice, I should remain within the same MSC as I have been, or if it is present, my home MSC.

213. The process of selecting a network was defined in GSM, certainly before September 2003, the priority date of the '933 patent. The '933 patent appears to acknowledge that in the Background section. *See, e.g.*, '933 patent (Ex. 1001) at 1:34-45.

214. Indeed, the GSM standards provided detailed rules to be followed when making the network selection. Some of these rules are described in TS-23.122 V5.2.0, dated December 2002, which is discussed in more detail below and in the specific invalidating combinations.

215. While it would be well known, Section 1.2 ("Definitions and abbreviations") states that the PLMN identity contains a MCC and MNC, thus any reference to "PLMN" of necessity refers to a pair of (MCC, MNC):

> **Home PLMN:** This is a PLMN where the MCC and MNC of the PLMN identity match the MCC and MNC of the IMSI. Matching criteria are defined in Annex A.

TS-23.122 (Ex. 1007) at 7.

216. While there are different modes of Network Selection, at least the "Automatic Network Selection Mode," as shown in part below, suffices. Clearly,

the process described below indicates that a mobile station would have to receive a plurality of MCC/MNC pairs to make the selection as indicated. As I discussed above in Section VI.C, a mobile would get this information by scanning a set of channels and extracting the MCC and the MNC transmitted by each base station. Thus, if for example, it found a MCC/MNC pair other than that of the home PLMN, it would continue to get additional MCC/MNC pairs until such time as it found a Home PLMN, if one is indeed available. Simply put, the process required by the 2002 standard required that the mobile station scan and receive a several MCC/MNC pairs and use the one of the highest priority available.

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN (if not previously selected);

ii) each PLMN in the "User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iii) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

v) other PLMN/access technology combinations in order of decreasing signal quality.

Id. at 14.

217. This is further reinforced in a different scenario, *i.e.*, in one where the mobile is already using a Visited PLMN (VPLMN), as described below:

4.4.3.3 In VPLMN

If the MS is in a VPLMN, the MS shall periodically attempt to obtain service on its HPLMN or higher priority PLMN listed in "user controlled PLMN selector" or "operator controlled PLMN selector" by scanning in accordance with the requirements that are applicable to i), ii) and iii) as defined in the Automatic Network Selection Mode in clause 4.4.3.1.1. In the case that the mobile has a stored "Equivalent PLMNs" list the mobile shall only select a PLMN if it is of a higher priority than those of the same country as the current serving PLMN which are stored in the "Equivalent PLMNs" list. For this purpose, a value T minutes may be stored in the SIM, T is either in the range 6 minutes to 8 hours in 6 minute steps or it indicates that no periodic attempts shall be made. If no value is stored in the SIM, a default value of 60 minutes is used.

The attempts to access the HPLMN or higher priority PLMN shall be as specified below:

a) The periodic attempts shall only be performed in automatic mode when the MS is roaming;

b) After switch on, a period of at least 2 minutes and at most T minutes shall elapse before the first attempt is made;

c) The MS shall make an attempt if the MS is on the VPLMN at time T after the last attempt;

d) Periodic attempts shall only be performed by the MS while in idle mode;

e) If the HPLMN or higher priority PLMN is not found, the MS shall remain on the VPLMN.

f) In steps i), ii) and iii) the MS shall limit its attempts to access higher priority PLMNs to PLMNs of the same country as the current serving VPLMN.

g) Only the priority levels of Equivalent PLMNs of the same country as the current serving VPLMN shall be taken into account to compare with the priority level of a selected PLMN.

Id. at 17.

218. In other words, there is another way in which the mobile may also "scan" and select the HPLMN over a non-home PLMN, having found multiple PLMNs, *i.e.*, multiple MCC/MNC pairs.

219. In addition to considering the MCC/MNC pair for selecting a PLMN, using a Location Area Code (LAC) in the network selection process was also known. For example, a company may designate certain Location Areas as "Forbidden LA." There is a variety of reasons a given LA may be so designated that are beyond relevance to the '933 patent. For example, the TS 23.122 standard specifies that "[t]he MS stores the forbidden LA identity (LAI) in a list of 'forbidden LAs for regional provision of service', to prevent repeated access attempts on a cell of the

forbidden LA." TS-23.122 (Ex. 1007) at 10. Similarly, there were rules preventing a mobile from camping on certain LAs, as shown in other sections of the standard. For example, the standard states: "If there were one or more PLMNs which were available and allowable, but an LR [Location Registration] failure made registration on those PLMNs unsuccessful or an entry in any of the lists of 'forbidden LAs for roaming', or 'forbidden LAs for regional provision of service' prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state." *Id.* at 15.

220. I note that all of the above was well known and used in at least the GSM networks well before September 2003, the earliest priority date of the '933 patent. While I will present a detailed analysis of invalidity below, I point out that the claim limitations of the '933 patent were well known prior to the '933 patent.

4. Preference for Certain Networks Over Other Networks and the Concept of Roaming

221. It is apparent from the above subsections that upon finding a cell with acceptable radio conditions, the mobile device can evaluate the network, the MCC and the MNC in particular as well as the LAC.

222. It is also apparent that the mobile device inherently, at least in GSM, has stored in the SIM card the Home Network MCC and MNC as they form part of the IMSI, which, as discussed above in Section VI.B.1, is stored on the SIM card.

223. As I explained above, choosing the Home Network over other networks entails much less overhead and is a natural and preferable choice. Not only is it apparent that making such choice is preferable, the GSM standards dictated so. A more detailed explanation of this will be in Section IX.B below where I specifically address each limitation as compared to the 3GPP standards.

224. However, within the notion of "network selection" is an important concept: Roaming. The term "roaming" has at least two, context-dependent, meanings. In particular, the answer to the question "when is, or is not, a mobile device roaming?" is different depending on the context in which the question is asked. I will address both below.

225. From a purely network design and operation perspective, a mobile that is camped on a cell of the home MSC (which by definition is in the home MCC/MNC) is not roaming. Furthermore, if it is camped on a non-home MSC it is roaming, since the visiting MSC must communicate with the home MSC and create an entry in the VLR for the visiting mobile device.

226. Consider, for example, my mobile device, discussed above, having as home MSC the AT&T NVA MSC. I, as an ordinary user, do not know where the boundaries of this MSC are. Do they extend as far as northeastern edge of Maryland? I have no way of knowing, and AT&T does not tell me. However, I can be quite certain that it does not extend as far as San Francisco. Furthermore, I do

not know which MNC is used in San Francisco by AT&T, but I will speculate that it is not 410, which is the one in the Baltimore/Washington as I discussed above. While which MSC is used by AT&T is not publicly available, I will, for the sake of example, assume that it is one of the 8 that I identified above, say 560. Thus, while my Home Network MCC/MNC is 310+410, the network my mobile will camp on in San Francisco is preferably (since I am an AT&T subscriber) 310+560. Clearly, I am roaming, not only am I on a different MSC, but I am on a different wireless network. Is that any different than being, say in Canada, camped on MCC/MNC = 302+652, which belongs to BC Tel Mobility?[15] How about if I happen to go to Greece and I am camped on a Greek network with MCC/MNC = 202+05 (which is part of the British Vodafone network, called Vodafone Greece) or on a different network with MCC/MNC = 202+01 (belonging to the Greek operator Cosmote)?

227. The answer in all of the above cases is that I am roaming. The respective MSCs will have to communicate with my home MSC, exchange security information (related to me), create an entry in their VLR, and my home MSC will have to keep track of the fact that I am "roaming" in the respective network.

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[15] *See* www.mcc-mnc.com.

228. That is simple enough. However, the word "roaming" has also had a different meaning since the inception of mobile communications, *i.e.*, AMPS. It related to billing issues.

229. When mobile communications were new in the USA, using the AMPS system, the providers (there were two of them in each location, the System A and the System B, as I discussed above) decided that they would charge extra fees (some argued very steep fees) to any user who was outside his/her home network. As a result, if a Washington, DC subscriber were to drive to Boston, he/she would have no idea what the costs would be. As soon as he/she got outside of the Washington network, "roaming charges" would be in play. Not only would one have to consult what the "roaming charges" are in each of the networks one would "roam" through, one would have no idea when a new network was being entered into. So, from the user's perspective, "roaming" came to mean that there were extra costs associated with using one's mobile device in certain locations.

230. However, the charging schemes for leaving the home network have changed dramatically over both time and location (*e.g.*, USA versus Europe versus countries in Asia or countries in Africa). So, for example, now AT&T does not charge me anything extra while I am using my phone anywhere in the USA. So, whether I am in Washington, Boston, San Francisco or anywhere in between I am not "roaming" in the sense of being charged extra. But if I go to Canada or Greece,

as discussed above, then I am roaming, one would think. However, that is not necessarily so; maybe "yes" and maybe "no." I have a plan with AT&T that allows me to use my phone in Canada and Mexico with no "roaming charges." Thus I am not roaming while in Canada. However, hypothetically speaking, my neighbor who may have a different payment plan agreement with AT&T that does not include Canada would in fact be roaming. In some instances, furthermore, AT&T may have an agreement to cross-serve the Greek Vodafone customers in the USA while Vodafone Greece serves the AT&T USA customers without either incurring any roaming charges. AT&T, in this hypothetical, may not have such an agreement with Cosmote, one of the other Greek operators. In that case, if I am camped on a Vodafone cell I am not roaming, but if I am camped on a Cosmote cell then I am roaming. If in the future these business arrangements change, my "roaming" status will change as well.

231. In short, while from a purely technical perspective whether a given mobile phone at a given place is or is not roaming is clear and unambiguous, from a user perspective's usage of the word "roaming" is dependent on current business arrangements that exist both between the user and the user's provider (*e.g.*, AT&T), as well as amongst the network providers involved (*e.g.*, AT&T, Vodafone Greece, and Cosmote in the example above).

5. Network Lists, Including PLMN Lists

232. While for any one subscriber having a unique IMSI there is one and only one "home network", *i.e.*, the one corresponding to the MCC/MNC of the IMSI, clearly, AT&T has more than one network in the USA, namely 8, as discussed above, and, for example, Verizon has a lot more. Going back as far as the 1990s, cellular service providers have often owned more than one network (*i.e.*, networks having different MCC/MNC pairs or other network identifiers).

233. Clearly, AT&T would prefer that I use the PLMN identified as MCC/MNC = 310+410 (as I assumed above to be my home PLMN) and a LAC that is part of my MSC, but AT&T would clearly know that that would be impossible if I am located in, say, San Francisco or many other places in the USA. Again, from AT&T's perspective any one of the 8 PLMNs, having the corresponding MCC/MNC, that AT&T has in the USA is part of the AT&T network. The same applies when viewed from the user's perspective. Thus, having a list of at least the 8 PLMNs that AT&T has is only a logical thing to do.

234. Thus, when a single provider (*e.g.*, AT&T or Verizon) has multiple networks, then one may refer to the collection of these networks as the "AT&T network." Similarly, the many Verizon PLMNs, collectively, constitute the "Verizon network." As long as a user is within the "AT&T network," the user may not consider him/herself as "roaming," irrespective of which MSC in one of the 8

PLMNs he/she is using. On the other hand, if the user is using the Cosmote network in Greece, then he/she might want to know that he/she is in fact roaming—at least with today's business arrangements.

D. Displaying Network Names

235. Displaying information on the screen of the mobile device is commonly used to display the most basic information, as discussed above in Section VI.B.4. Clearly, one of the desired pieces of information is the "network" that one is using. Strictly speaking, in a GSM or UMTS system that means at least MCC/MNC, as that identifies the specific PLMN. Other than technocrats, such as myself, most people would say who cares. What does 310410 mean? What does 20201 mean? Nothing to most people! I would find it interesting because I would know how to interpret 310410 to mean USA+AT&T (*i.e.*, 310 = USA, 410 = AT&T, in fact which of the several AT&T MNCs) network and 20201 to mean Greece+Cosmote (*i.e.*, 202 = Greece, 01 = Cosmote) network. Clearly, the user interface is not designed to please technocrats such as myself—and indeed it should not be so designed. Furthermore, displaying anything more than AT&T (or Verizon or the equivalent) as it relates to the network information would be redundant. Simply displaying "AT&T" or "Verizon" is enough, and not too much, for most users.

236. Indeed, some standards prescribe more than others as to exactly what is to be displayed to the user as it regards to the network being used. As discussed

below in Section VII.A, according to the patentee, this is arguably the inventive step of the ’933 patent. But, as I will discuss in said sections below, even that aspect was well known in the prior art.

237. The idea of displaying a network name on a mobile device display was written about in standards and patents many years before the ’933 patent. For example, U.S. Patent No. 5,950,130 (Ex. 1024) (filed on March 18, 1997) describes a mobile station able to display . . . an alphanumeric name when operating on a given system.” ’130 patent (Ex. 1024) at Abstract; *id.* at 6:15-18, 11:18-21. In the ’130 patent, when it is determined that a mobile device is on its home network, “a Home SID Alpha Tag (e.g., an alphanumeric tag such as ‘Home’ and/or the name of the home network system) or other type of indication (e.g., a Home SID icon or status light) may be displayed . . . . The Home SID Alpha Tag may be displayed, for example, on the display 65 of the mobile station 68.” *Id.* at 17:17-26.

238. It was also well known to display a roaming signal when it is determined that a subscriber is not in his or her home network. For example, U.S. Patent No. 5,862,471 (Ex. 1025) (which is a continuation of an application filed on March 21, 1995) explains that it was known that “when a mobile station is roaming, a signal indicative of the roaming condition is provided to the user and displayed as a result of a comparison of the system identification (SID) of the subscribed system which is semi-permanently stored in the mobile station with the SID of the system

providing service broadcast from the base station." '471 patent (Ex. 1025) at 1:50-55.

239. Additional prior art disclosing these features is discussed in more detail below.

VII. BACKGROUND OF THE '933 PATENT

A. Summary of the '933 Patent

1. Background and Admitted Prior Art to the '933 Patent

240. The '933 patent, which was filed on September 2, 2004, is titled "Home Network Name Displaying Methods and Apparatus for Multiple Home Networks." It was originally assigned to Research in Motion Limited (*i.e.*, Blackberry) and I understand that it is now assigned to 3G Licensing S.A. According to the abstract, the '933 patent discloses "[h]ome network name displaying methods and apparatus for multiple home networks." '933 patent (Ex. 1001) at Abstract.

241. The Background of the '933 patent explains many concepts that were already known in the art when the application for the '933 patent was filed. First, the '933 patent recognizes, as I explained above, that "more than one wireless network is typically available in many, if not most, geographic regions." *Id.* at 1:27-29. Yet, "[a]lthough different networks are available, a mobile station automatically selects and registers with its home communication network (*i.e.*, the network of the contracted service provider) for operation." *Id.* at 1:34-37. The '933 patent further acknowledges that, in the prior art, "[t]ypically, the mobile station receives a Mobile

Country Code (MCC) and a Mobile Network Code (MNC) from each network and operates with a preference towards choosing that network having the MCC/MNC pair uniquely associated with the home network." *Id.* at 1:37-41.

242. With respect to determining which network to choose, the '933 patent states: "The MCC/MNC pair of the home network is stored on a Subscriber Identity Module (SIM) in a home public land mobile network (HPLMN) file. Other networks are stored in a prioritized fashion in a 'preferred' PLMN list on the SIM." *Id.* at 1:42-44. The mobile station then "retrieves and displays a service provider name (e.g., "T-Mobile" or "AT&T Wireless") from the SIM which corresponds to the unique MCC and MNC combination of the selected network." *Id.* at 1:46-50.

243. According to the '933 patent, this network name display procedure may cause confusion. *See id.* at 1:54-2:11. The '933 patent explains that "competing wireless networks have established relationships whereby mobile stations can receive services through the other's network when necessary or desired. *Id.* at 1:54-58. In other words, some wireless providers have relationships through which a mobile station can "receive services and communicate through a different network associated with an MCC/MNC pair different from that of the home network," sometimes referred to as "roaming." *Id.* at 1:58-67. In a competitive network relationship, a subscriber may incur additional "roaming" charges "and the name of the competitor's network service may be displayed in the visual display."

Id. at 1:63-67. By contrast, in a more cooperative network relationship, a subscriber may not incur any additional roaming charges using this alternate network. *Id.* at 2:1-3. With existing network name display procedures, however, a subscriber may nonetheless see a network name that is different than the home network and assume that he or she is incurring roaming charges, when in fact he or she is not. *See id.* at 2:1-8.

244. Known at the time of the '933 patent was a naming technique referred to as "Enhanced Operator Named String" (EONS) procedure. *See id.* at 2:8-13. Using EONS, "instead of displaying a name that is different from that of the home network in the above-scenario, the same or substantially similar 'home network' name may be displayed even though a different network is actually being used." *Id.* at 2:13-20.

245. Another purported problem with the prior art results from network operators acquiring "one or more networks which have MCC/MNC pairs different from that of the primary home network's." *Id.* at 2:23-26. A mobile station can be programmed to preferentially select and register with one of these "home" networks. Subscribers, however, can become confused as to whether roaming charges may be incurred because the names of these acquired MCC/MNC pairs may not correspond to what the subscriber understands as being his or her "home" network. *Id.* at 2:23-33. Thus, according to the '933 patent, there was a "need for improved home

network name displaying methods and apparatus for multiple home networks." *Id.* at 2:38-40.

2. Alleged Invention of the '933 Patent

246. The '933 patent purports to address this need by associating multiple home PLMNs (MCC/MNC pairs) with a single home network display name. *Id.* at 2:51-55. If there is "a match between the received MCC and MNC pair and any one of the home network MCC and MNC pairs, the home network display name is visually displayed in a display of the mobile station." *Id.* at 2:49-58. On the other hand, if no match exists between the MCC/MNC pair and any one of the home MCC/MNC pairs, "an alternate name is selected for display." *Id.* at 2:59.

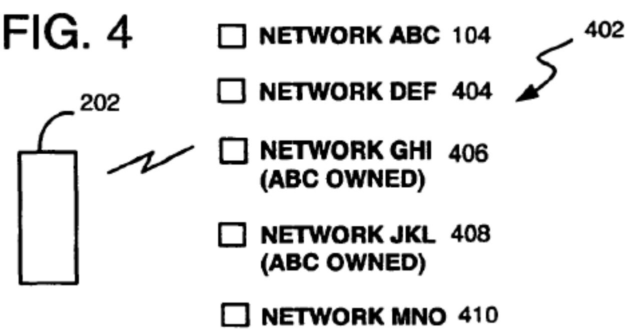
247. Based on the Summary of the '933 patent, the steps of the allegedly inventive method can be summarized as follows:

> (1) receiving MCC/MNC codes corresponding to communication networks in the area;
>
> (2) selecting and registering with one of the networks;
>
> (3) comparing the MCC/MNC pair of the selected network with a list of MCC/MNC pairs, each associated with the same home network display name;
>
> (4) if there is a match, visually displaying the home network name; and
>
> (5) if there is not a match, displaying an alternate name or a roaming indicator.

Id. at 2:44-67.

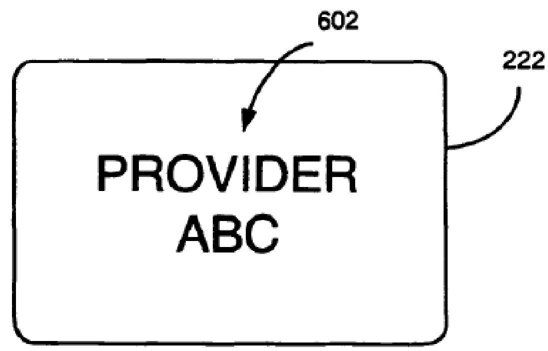
248. Additional detail is provided in the figures of the ’933 patent. For example, Figure 4 (reproduced below) illustratively shows five different networks, each associated with a unique MCC/MNC combination, that are available to mobile station 202. *Id.* at 11:47-53, 56-63. Network ABC is the mobile station’s “home network.” *Id.* at 11:53-56. Networks GHI and JKL are owned by Network ABC and are designated as part of the home network, even though they are associated with different MCC/MNC pairs than Network ABC. *Id.* at 11:66-12:11. By contrast, the other two networks (Networks DEF and MNO) are not associated with the home network and their use will “impart roaming status to mobile station 102.” *Id.* at 12:11-14.

FIG. 4



249. According to the alleged invention of the ’933 patent, as shown in Figure 6 (below), “the mobile station will visually display the same service provider name 602 of home network ABC 104 regardless of whether network ABC 104, network GHI 406, or network JKL 408 is selected by the mobile station.” *Id.* at 12:15-23. By contrast, “[a] network name different from “PROVIDER ABC” will be displayed when networks DEF 404 and MNO 410 are utilized.” *Id.* at 12:26-29.

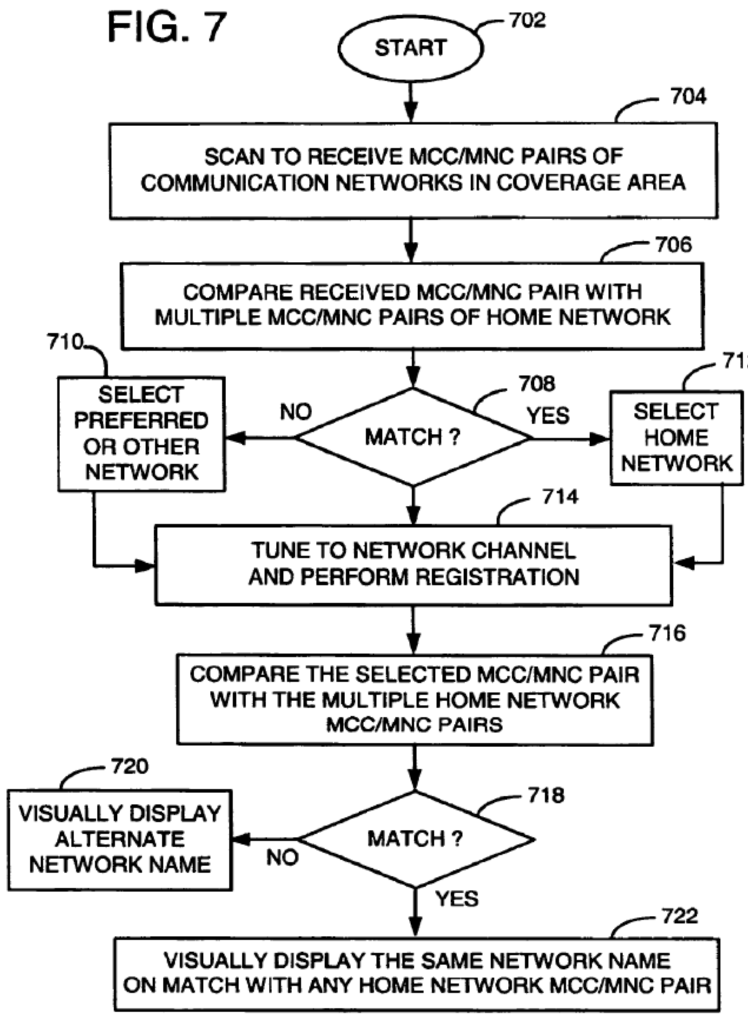
FIG. 6



250. Figure 7 of the '933 patent depicts a flowchart of the claimed home network name display method. First, in step 704, a mobile station scans to receive a plurality of MCC/MNC codes corresponding to multiple networks in a given coverage area. *Id.* at 13:52-57. Next, in step 706, "the mobile station compares a received MCC/MNC pair with multiple MCC/MNC pairs associated with a home communication network." *Id.* at 13:57-59. In other words, instead of a single HPLMN, the mobile station stores an "HPLMN list" with a plurality of MCC/MNC pairs considered "part of the 'home network.'" *Id.* at 13:57-62. As shown in steps 708 and 712, if there is a match with one of the MCC/MNC pairs in the HPLMN list, "the mobile station selects this 'home' network which is associated with the MCC/MNC pair for communication." *Id.* at 13:64-67. But, "if there is no match, the mobile station selects a preferred network or other non-home network," as shown in step 710. *Id.* at 13:67-14:2. In step 716, after tuning to and registering with the selected network, "the mobile station compares the received MCC and MNC pair associated with the selected network with each one of the multiple home network

MCC/MNC pairs." *Id.* at 14:6-8. As shown in steps 718 and 722, if there is a match—*i.e.*, if the selected MCC/MNC pair corresponds to a "home" network—the mobile station displays the home network name in its visual display. *Id.* at 14:9-14. In other words, "the same network name will be displayed for any MCC and MNC pair in the home network list." *Id.* at 14:12-14. If there is no match, as shown in step 720, the mobile station displays an alternate, non-home network name in the visual display. *Id.* at 14:14-17.

FIG. 7



B. File History of the '933 Patent

251. In forming my opinions, I have also reviewed the file history of the '933 patent.

252. The application for the '933 patent was filed on September 2, 2004, and claims the benefit of European application No. 03255483, filed on September 3, 2003. '933 patent at [22], [30]; FH (Ex. 1002) at 1, 41.

253. On May 11, 2006, the Examiner rejected pending claims 1-21, 23, 25, and 27 as obvious over U.S. Patent No. 6,195,532 ("Bamburak") (Ex. 1026) in view of U.S. Patent Publ. No. 2001/0001875 ("Hirsch") (Ex. 1027). FH (Ex. 1002) at 163-169. He also rejected pending claims 22, 24, and 26 as obvious over Bamburak in view of Hirsch and U.S. Patent Publ. No. 2002/0111180 ("Hogan") (Ex. 1028).

254. In response, the patentee amended the pending claims to require, among other things, "giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list" and "causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs." *Id.* at 177-188. The patentee explained that Bamburak failed to teach or suggest "the use of a plurality of home network MNC and MCC pairs corresponding to networks in a [HPLMN] list as claimed." *Id.* at 186-187. Instead, Bamburak only taught the use of a single

home network. *Id.* The patent also canceled 9 pending claims (claims 4, 6, 11, 13, 18, 20, 23, 25, and 27) and added one new independent claim (claim 28).

255. The Examiner again rejected all pending claims as obvious over Bamburak and Hirsch, as well as claims 22, 24, and 26 as obvious over Bamburak, Hirsch, and Hogan. FH (Ex. 1002) at 196-204. The Examiner disagreed with patentee, finding that patentee had improperly attacked the references individually instead of as part of the combination that the Examiner had identified. *Id.* at 196. The Examiner further determined that for the limitation "the plurality of home network MCC and MNC pairs are stored on the SIM, <u>and</u> otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station in the comparing step," the addition of the word "and" was necessary to clarify whether the step following the "and" was a "different" step or "necessarily inclusive to the previous step." *Id.* (emphasis in original). The Examiner sought clarification from the patentee regarding what he intended to claim. *Id.*

256. In response and at the suggestion of the Examiner, the patentee amended the pending independent claims to include the word "and," as shown below.

> for the step of comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) in the comparing step based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, <u>and</u> otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station in the comparing step;

FH (Ex. 1002) at 210. The patentee further argued that the combination of Bamburak and Hirsch did not teach or suggest each and every limitation in the claims, such as the use of "a plurality of home network identifications of a HPLMN list," and that there was no motivation to combine Bamburak and Hirsch. *Id.* at 217-222. The patentee argued that the teachings were incompatible because Hirsch described a one-time configuration procedure of a mobile station, and a POSITA would not be motivated to combine that teaching with the network name displaying method in Bamburak. *Id.*

257. The Examiner allowed the claims on May 8, 2007, and the '933 patent issued on September 25, 2007.

258. Based on my review of the record, none of the references that I address in this Declaration were considered by the Examiner during the prosecution of the '933 patent.

VIII. OVERVIEW OF CONCLUSIONS

259. In this Declaration, I provide four prior art references with exemplary citations identifying the relevant features related to the claim language of the Challenged Claims.[16] I have also described combinations of these prior art references that, when combined, render the Challenged Claims of the '933 patent

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[16] The complete text of the Challenged Claims is set forth in Appendix B hereto.

obvious. It is my opinion that the Challenged Claims of the '933 patent are rendered obvious in light of the prior art specifically discussed in this Declaration.

260. It is my opinion that a person of ordinary skill would consider at least the prior art references below:

Prior Art Reference	Exhibit No.
U.S. Patent Appl. Publ. No. 2003/0022689 ("McElwain")	Ex. 1004
U.S. Patent No. 7,027,813 ("Hicks")	Ex. 1006
U.S. Patent Appl. Publ. No. 2004/0204136 ("Uchida")	Ex. 1005
3GPP TS 23.122 V5.2.0 ("TS-23.122") 3GPP TS 22.101 V5.8.0 ("TS-22.101") 3GPP TS 31.102 V5.3.0 ("TS-31.102") (collectively, "3GPP Standards")	Ex. 1007 Ex. 1008 Ex. 1009

261. Specifically, it is my opinion that the claims of the '933 patent are obvious as follows:

'933 Patent Claims	Basis of Invalidity
1-3, 6-8, 11-13, 19	Obvious in view of McElwain
1-3, 6-8, 11-13, 19	Obvious in view of McElwain and Uchida
4, 9, 14	Obvious in view of McElwain, Uchida, and Hicks
1-4, 6-9, 11-14, 19	Obvious in view of McElwain and Hicks
1-4, 6-9, 11-14, 19	Obvious in view of 3GPP Standards and McElwain

262. I am also not aware of any secondary considerations of non-obviousness that affect my conclusions regarding the obviousness of these claims.

IX. ANALYSIS OF BASES OF INVALIDITY

263. Below is a detailed analysis of the bases of invalidity identified above.

264. The citations presented in this Declaration are exemplary disclosures from the prior art, including disclosures that identify: (1) the problem(s) confronted by one of ordinary skill in the art; (2) an express suggestion to make one or more of the combinations; (3) an implicit suggestion to make one or more of the combinations; or (4) the knowledge of those skilled in the art as to the applicable field of technology.

265. I also note that claim 1 in the '933 patent is a method claim and claims 2 through 5 depend from claim 1; claim 6 is an apparatus claim and claims 7 through 10 depend from claim 6; claim 11 is a computer program product claim and claims 12 through 18 depend from claim 11; and claim 19 is a method claim. Because of the different claim types, there exist slight differences in the claim language (*e.g.*, "selecting" versus "select"). However, these differences are immaterial for the purposes of my conclusions regarding unpatentability and do not affect my analysis. For my analysis, I have grouped claim limitations where they are substantively similar or where I thought it made sense to discuss them together.

A. Grounds of Invalidity Based on McElwain

1. Overview of Prior Art References

a. McElwain

266. I have reviewed U.S. Patent Appl. Publ. No. 2003/0022689 ("McElwain") (Ex. 1004), which was filed on September 27, 2001, and was published on January 30, 2003. I understand that McElwain is available as prior art as of the date it was filed.

267. McElwain discloses "a method for relating a plurality of system identifications (SIDs) in a mobile device." McElwain (Ex. 1004) ¶ 20. McElwain discloses a mobile station that "comprises a display 110 that displays data," "[m]emory 12," or "memory 12A which may be embedded or which may be removable, such as a removable Subscriber Identification Module (SIM)." *Id.* ¶ 33. McElwain further discloses that "[m]emories 12 and 12A include storage locations storing data and instructions that controls the operation of processor 170 to implement functions according to embodiments of the invention." *Id.* "Processor 170 generates appropriate commands and controls the other component blocks of mobile station 10." *Id.*

268. Figure 2 illustrates an embodiment of "mobile station 10 that is suitable for practicing this invention." *Id.* ¶ 34, Fig. 2.

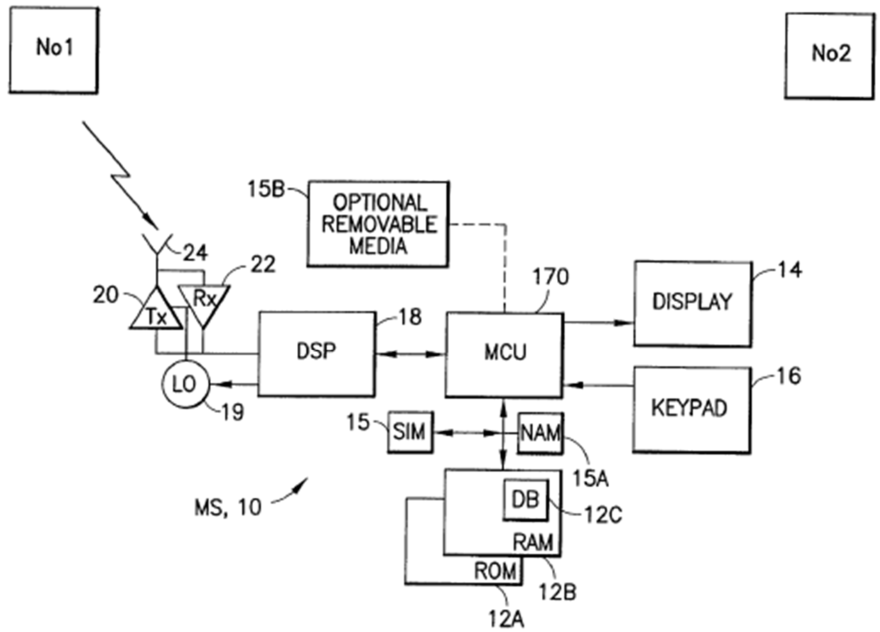


FIG.2

269. McElwain further describes the mobile station as containing a "wireless section that includes a digital signal processor (DSP) 18 . . . as well as a wireless transceiver comprised of a transmitter 20 and a receiver 22, both of which are coupled to an antenna 24 for communication with the currently selected network operator." *Id.* ¶ 37. It also teaches that the wireless transceiver has the ability to "tune to different frequency channels when scanning and otherwise acquiring service." *Id.* Additionally, McElwain's mobile station includes microprocessor control unit (MCU) 170, which "generates appropriate commands and controls the other component blocks of mobile station 10." *Id.* ¶¶ 33, 37.

270. McElwain discloses a "separate removable SIM 15 can be provided." *Id.* ¶ 38. However, "[i]n alternate embodiments the database 12C may[ ]be stored

on another type of removable media 15B, such as a card containing a memory and/or a microprocessor, such as a 'smartcard.'" *Id.* As an example, McElwain teaches that "the Cousin SID list 200," which I will describe in more detail below, may be programmed "directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the customer along with the mobile station 10." *Id.* ¶ 40.

271. McElwain explains that in the "North American cellular system each provider within a market area is preferably assigned a distinct, fifteen bit SID." *Id.* However, McElwain recognized that its method could be implemented on "the Global System for Mobile Communications (GSM) standard," which "defines a process for network selection based on the mobile station reading the GSM equivalent of the SID, called the Public Land Mobile Network (PLMN) identity." *Id.* McElwain further explains that the cellular protocol used with its invention "could conform to any of the above-mentioned ANSI-136, AMPS, CDMA or various ones of the GSM protocols." *Id.* ¶ 36. Thus, in my analysis, I often refer to the embodiment of McElwain using the GSM equivalent to a SID (PLMN), which includes an MCC/MNC pair. In connection with this embodiment, a POSITA would have understood that any reference to a "SID" in McElwain could be understood as a reference to an MCC/MNC pair.

272. McElwain also describes a "conventional cellular network," shown in Figure 3, where the mobile station is able to "communicate with either cell site 30 or cell site 40." *Id.* ¶ 42, Fig. 3. McElwain further discloses that "the extent to which mobile station 10 will be able to communicate with cell site 30 or cell site 40 will depend on the geographic location of the mobile station 10 and the size of the cell coverage area of each cell site." *Id.*

273. According to the method described in McElwain, "[t]he SID or equivalent system identification number" (*i.e.*, a PLMN) "is broadcast by each cell site 30, 40 and is used by the mobile station 10 to determine whether the mobile station is operating on its home network, or whether it is operating in a roaming condition." *Id.* ¶ 45. The mobile station stores "a plurality of geographically-related SIDs" in "a list or database referred to" as the "Cousin SID list" (*i.e.*, "a Home PLMN (HPLMN) list"). *Id.* When the mobile station receives a SID that "matches any one of the stored SIDs in the Cousin SID list 200," the mobile station determines that "the associated service provider is a Home service provider, and that the mobile station 10 is not roaming." *Id.* ¶ 46.

274. Figure 4B of McElwain and the accompanying description illustrates this method in additional detail. *Id.* ¶¶ 48-50, Fig. 4B.

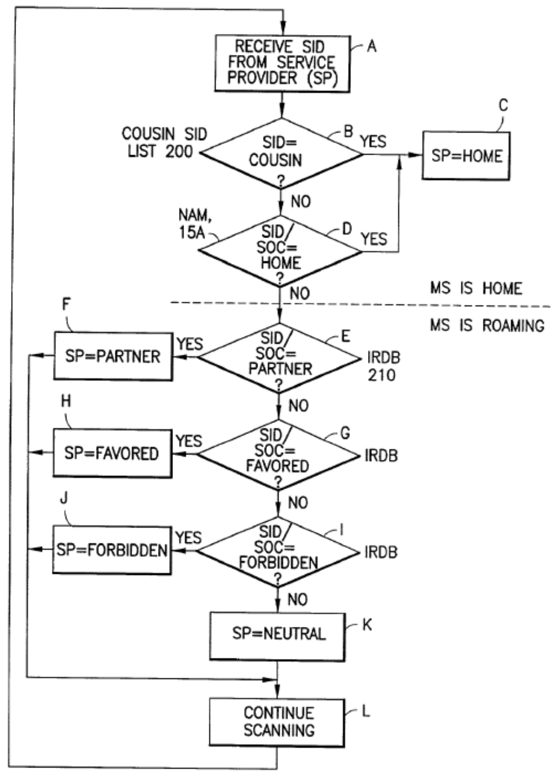


FIG.4B

275. According to McElwain and Figure 4B, first, in Step A, the mobile station scans and receives a SID (*e.g.*, a PLMN) from a service provider (*i.e.*, "wireless communication network"). *Id.* ¶ 48. In Step B, the mobile station "determines if the received SID is found in the Cousin SID list 200." *Id.* ¶ 50. In Step C, if the SID is in the Cousin SID list, the service provider is declared to be the "Home service provider" of the mobile station. *Id.* ¶ 50. McElwain demonstrates this with the following pseudocode. *Id.* ¶ 51.

```
<begin "Prepaid SW">
/* cousin SID is checked from a separate list than IRDB */
.if cousin_sid match => SP category is Home
<end "Prepaid SW">
```

276. McElwain teaches that "[i]f a match does not occur," then "the mobile 10 can be assumed to not be located in the geographical region," and the SID is compared with the SIDs stored in a "conventional intelligent roaming database (IRDB) table 210" (*i.e.*, "Preferred PLMN (PPLMN) list") to determine if it corresponds to a preferred SID, such as a "Partner SID" or a "Favored SID." *Id.* ¶ 49. If there is a match with one of the SIDs in the IRDB table, the mobile station is considered to be roaming. *Id.* McElwain further discloses that if no matches are found, "the mobile station 10 continues to scan for a Home system or for a more preferred system if the Home system cannot be found." *Id.* McElwain notes that "[a]ny suitable scanning technique may be employed. For example, scanning may be continuous or non-continuous." *Id.*

277. McElwain teaches that the mobile station "preferably gives priority in the system selection for SIDs that reside in the cousin SID list" (*i.e.*, HPLMN). *Id.* ¶ 52. McElwain additionally teaches that "the mobile station 10 may provide a visual or other display to the user to inform the user of the current service provider status." *Id.* ¶ 54; *see also id.* ¶ 22. The mobile station therefore displays to the user whether he or she is connected to a home network, as opposed to a roaming network. *Id.* ¶ 22, 54. Thus, this teaches to a POSITA that the same home network display name can be displayed if the SID is determined from the Cousin SID list to correspond to a home service provider.

b. Uchida

278. I have reviewed U.S. Patent Appl. Publ. No. 2004/0204136 ("Uchida") (Ex. 1005), which was filed on December 9, 2002, and published on October 14, 2004. I understand that Uchida is available as prior art as of the date it was filed.

279. Uchida discloses techniques for "displaying system tags in wireless communication systems." Uchida (Ex. 1005) ¶ 2. Although Uchida teaches the method within the context of CDMA, it expressly discloses that its teachings may be applied to various wireless communication systems, such as GSM (*id.* ¶¶ 4, 92) or W-CDMA (*id.* ¶¶ 4, 36, 87, 92). Thus, in my analysis, I often refer to the embodiment of Uchida using the GSM identifiers (*i.e.*, a PLMN, which includes an MCC/MNC pair) rather than the CDMA identifiers (*i.e.*, a SID and/or NID). In connection with this embodiment, a POSITA would have understood that any reference to a "SID/NID pair" in McElwain could be understood as a reference to an MCC/MNC pair.

280. As background, Uchida explains that a wireless terminal "maintains a list of one or more home systems, with each home system being identified by its unique (SID, NID) pair" (*e.g.*, PLMN or MCC/MNC pair). *Id.* ¶ 6. "The terminal can then determine whether or not it is in communication with a home system based on its home (SID, NID) pairs and the (SID, NID) pair received from a serving system." *Id.*

281. Uchida discloses a "wireless communication network" that includes multiple base stations. *Id.* ¶ 26. The base stations each provide service for a system with a particular (SID, NID) pair. *Id.* "Each terminal includes a list of one or more (SID, NID) pairs for one or more systems that are designated as the home system for the terminal" (*i.e.*, Home PLMN (HPLMN) list). *Id.* ¶ 27.

282. Uchida further describes that "system tags are provided herein for display on a terminal screen based on the roaming status of the terminal." *Id.* ¶ 33. Uchida also discloses that the "system tags may be stored in non-volatile memory" and that "non-volatile memory may be . . . a Universal Subscriber Identity Module (USIM) defined by W-CDMA, and so on." *Id.* ¶ 36. Uchida teaches that "the home system tag" (*i.e.*, for home networks) and "specific tag list" (*i.e.*, for non-home networks) "are stored in . . . different sections of a non-volatile memory or in . . . separate storage areas within the terminal." *Id.* ¶ 41.

283. According to Uchida, when a wireless terminal "obtains service from a home system," the "home system tag . . . is displayed." *Id.* ¶ 34. One example, according to Uchida, is the "home system tag includes a text string of 'Welcome to the home system.'" *Id.* ¶ 37, Fig. 3A. As shown in Figure 3A, the "Home SID/NID List" (*i.e.*, HPLMN list) contains a list of SID/NID combinations (*i.e.* MMC+MNC pair or PLMN) and a "Home System Tag." *Id.* ¶ 37, Fig. 3A. "This home system

tag is displayed by the terminal whenever it receives service from any one of the systems included in the home SID/NID list." *Id.* ¶ 37.

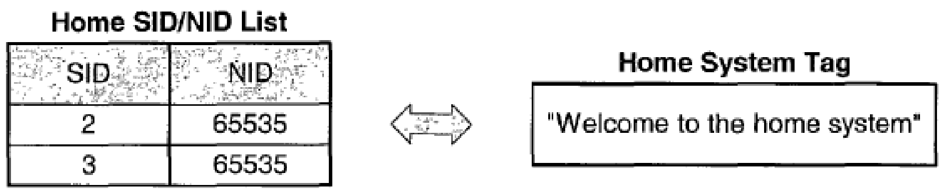


FIG. 3A

284. Uchida further describes that when the wireless terminal obtains service from a system with a SID/NID associated with a specific tag, "the specific tag associated with the matched SID value is displayed on the terminal screen." *Id.* ¶ 40, Fig. 3C.

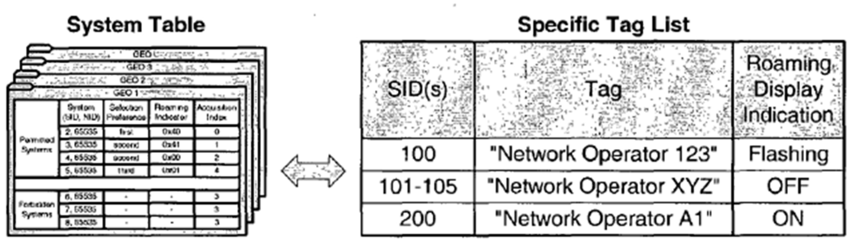


FIG. 3C

285. According to Uchida, Figure 7 shows a flow diagram "for displaying the proper system tag based on the roaming status of the terminal." *Id.* ¶ 78, Fig.7. After a valid system is acquired (*i.e.*, the mobile station selects and registers with a network), "[a] determination is then made whether or not the serving system is a home system for the terminal. This determination may be made based on the home SID/NID list for the terminal and the (SID, NID) pair for the serving system. If the

serving system is a home system, then the home system tag is displayed." *Id.* ¶¶ 80-81. But, "if the serving system is not a home system," a different system tag or a roaming indicator is displayed. *Id.* ¶¶ 82-83. Uchida further teaches that "service is obtained from the most preferred system found by the terminal." *Id.* ¶ 80.

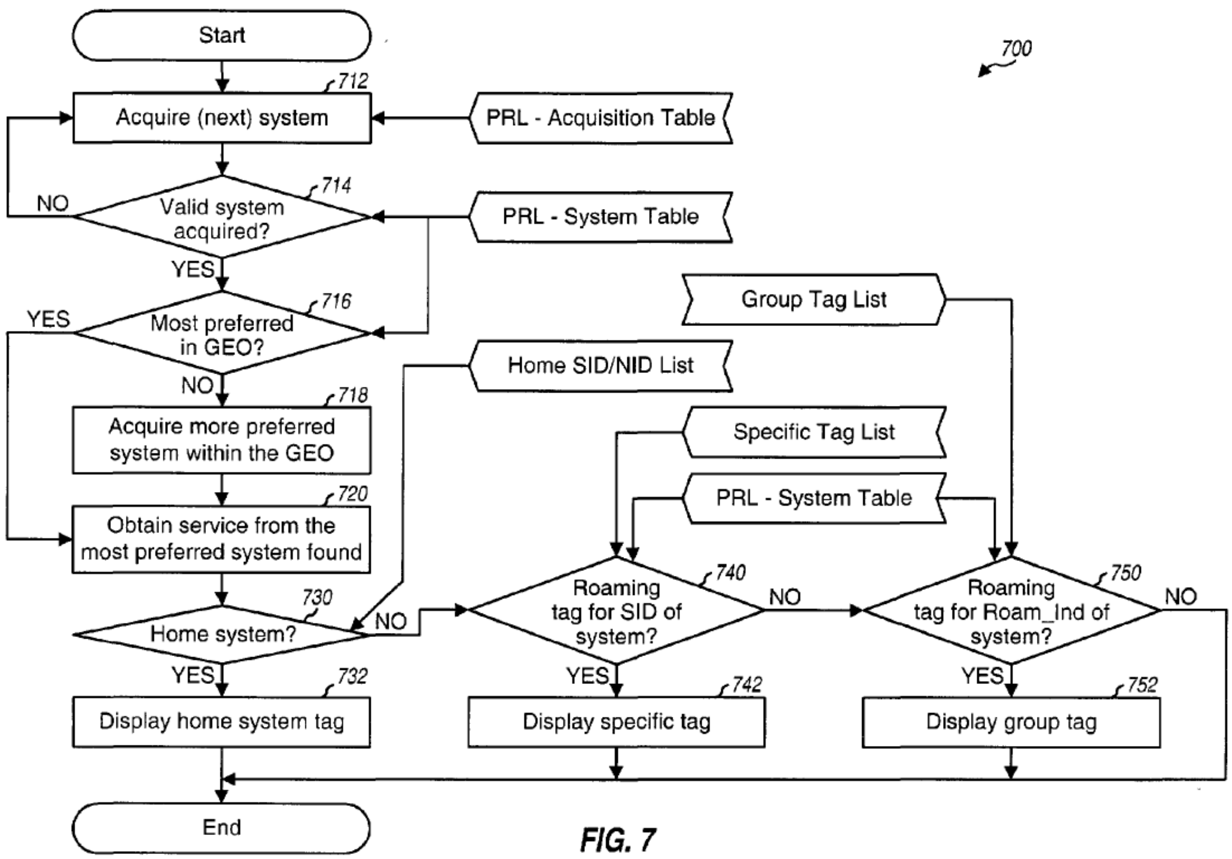


FIG. 7

c. Hicks

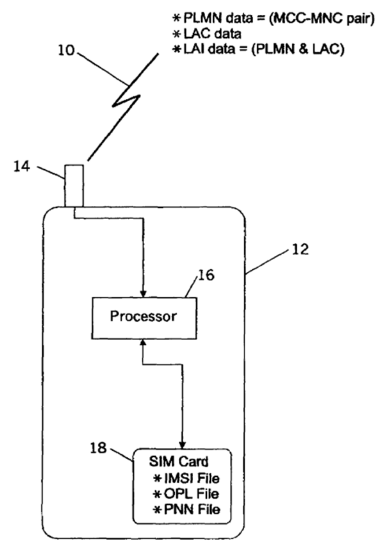
286. I have reviewed U.S. Patent No. 7,027,813 ("Hicks") (Ex. 1006), which was filed on September 30, 2002, and issued on April 11, 2006. I understand that Hicks is available as prior art as of the date it was filed.

287. Hicks discloses a system and method for determining whether a mobile phone is in a home area, including displaying the same network name for multiple

HPLMN codes. Hicks (Ex. 1006) at 1:33-36, 2:3-18. Hicks teaches that a mobile phone contains "a SIM file called Operator PLMN List (OPL) to provide sets of PLMN ranges" (*i.e.*, HPLMN list), where each "points to associated alphanumeric tags contained in another SIM file called PLMN network name (PNN)." *Id.* at 2:3-10.

288. Hicks illustrates the mobile phone used in the present invention in Figure 1.

FIG. 1



289. Hicks describes that the mobile phone receives a wireless signal via an antenna. *Id.* at 2:28-29. The received signal includes "PLMN (Public Land Mobile Network) data and LAI (Location Area Information) data." *Id.* at 2:29-31. Hicks recognizes that the "PLMN data is a composite of an MCC-MNC identifier." *Id.* at 2:32. Hicks further describes that the "LAI information is a composite of the PLMN data and an LAC (Location Area Code) identifier." *Id.* at 2:33-34. Hicks explains

that the "LAC identifier in the present invention refers to the ability of a mobile network to subdivide and identify its coverage area into location areas." *Id.* at 2:36-39.

290. Hicks discloses that the "received signal is forwarded from the antenna 14 to a processor 16 for analysis." *Id.* at 2:40-41. "Processor 16 is also coupled with SIM card 18. SIM card 18 includes, among other things, an IMSI (International Mobile Subscriber Identity) file, an OPL (Operator PLMN List) file, and a PNN (PLMN Network Name) file." *Id.* at 2:42-45.

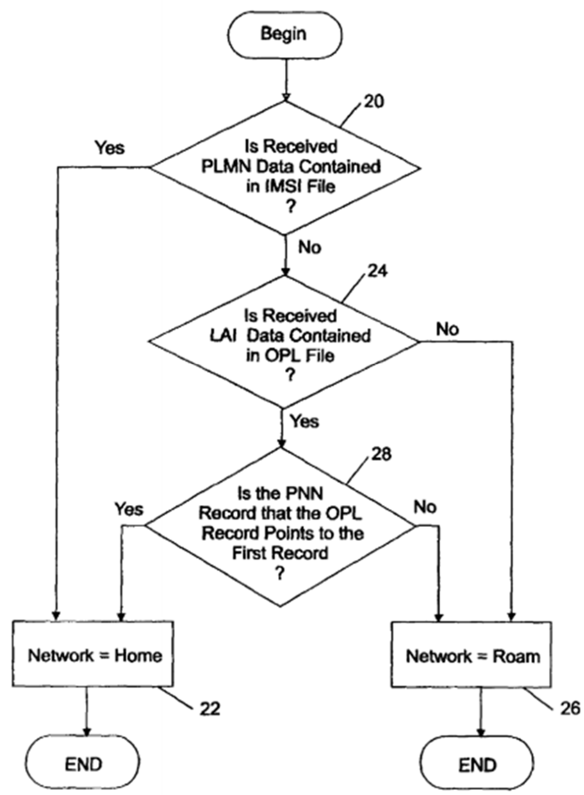
291. Figure 2 of Hicks illustrates the method to "determine whether the mobile phone is in a home area or in a roaming area." *Id.* at 2:47-48. Hicks discloses:

> To determine whether the mobile phone is in a home area or in a roaming area the processor first performs a check on the PLMN control information in the received signal. If the currently received PLMN data matches the PLMN data in the SIM card's IMSI file 20, then the network is deemed to be a home network 22. If the currently received PLMN data does not match the PLMN data in the SIM card's IMSI file, then the currently received LAI data is checked to see whether it matches any LAI data in the OPL file of the SIM card 24. If the currently received LAI data does not match any LAI data in the OPL file, then the current network is deemed to be a roaming network 26. If the currently received LAI data does match LAI data in the OPL file, then the OPL file is examined to see whether the PNN record that the

OPL record points to is the first record in the PNN file 28. If it is, then the network is a home network 22. If it is not, then the network is a roaming network 26.

Id. at 2:46-63, Fig. 2.

FIG. 2



292. In other words, Hicks discloses that the mobile phone checks selected PLMN information against the OPL file. *Id.* at 2:47-56. If the PLMN in the OPL file points to the first PNN record, it is determined to be a "home network." *Id.* at 2:56-63. If not, the PLMN is determined to be a roaming network (*i.e.*, non-home network). *Id.* at 2:63. Thus, for any of the PLMNs contained in the OPL file that point to the first record in the PNN file, the PLMN is a "home" network. *Id.* at 3:6-

10, Fig. 3. If the PLMN does not match one of the OPL records that point to the first record in the PNN file, the network is deemed to be a roaming network. *Id.* at 3:11-13, Fig. 3.

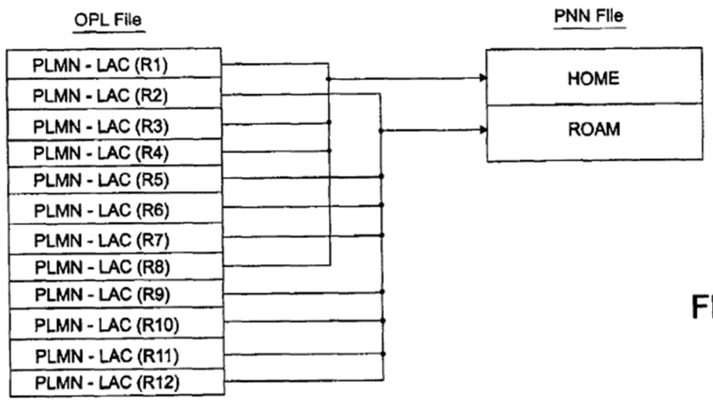


FIG. 3

293. Hicks further discloses that once the "type of network is determined," the mobile phone may, for example, "provide[] an audible or visual indication that the mobile phone has entered an area in which roaming charges may apply." *Id.* at 3:15-18. The mobile phone may also display "an indicator such as a special tone, a screen display icon, or lit indicator bulb." *Id.* at 3:19-21. Additionally, Hicks "provides a mechanism for indicating when a mobile phone is in a home network." *Id.* at 3:39-41.

294. Hick discloses that the described method may "take the form of a computer program product, which can be embodied by a computer-usable or computer-readable storage medium having computer-usable or computer-readable program instructions, 'code' or a 'computer program' embodied in the medium for use by or in connection with the instruction execution system." *Id.* at 3:57-63.

2. Motivations to Combine

a. McElwain and Uchida

295. In my opinion, a POSITA would have been motivated to combine McElwain and Uchida. Specifically, a POSITA would have used Uchida's method of determining the system tag to display—including by displaying the same home network name for all home networks in a Home SID/NID List as taught in Uchida—with the system and method for network selection and registration taught in McElwain. In the combined system, as shown below, following the selection and registration with a network as taught in McElwain, the MS would compare the selected PLMN (MCC/MNC pair) with a list of MCC/MNC pairs in a Home SID/NID List, as taught in Uchida. The Home SID/NID List would contain all of the "home" networks in McElwain's Cousin SID list (*i.e.*, the recited HPLMN list), with each MCC/MNC pair in the Home SID/NID List corresponding to the "home" network name, as taught in Uchida. If there is a match between the selected MCC/MNC pair and Home SID/NID List, the MS would display the home network name; if there is no match, the system would display a different, "roaming" network name, as taught in Uchida.

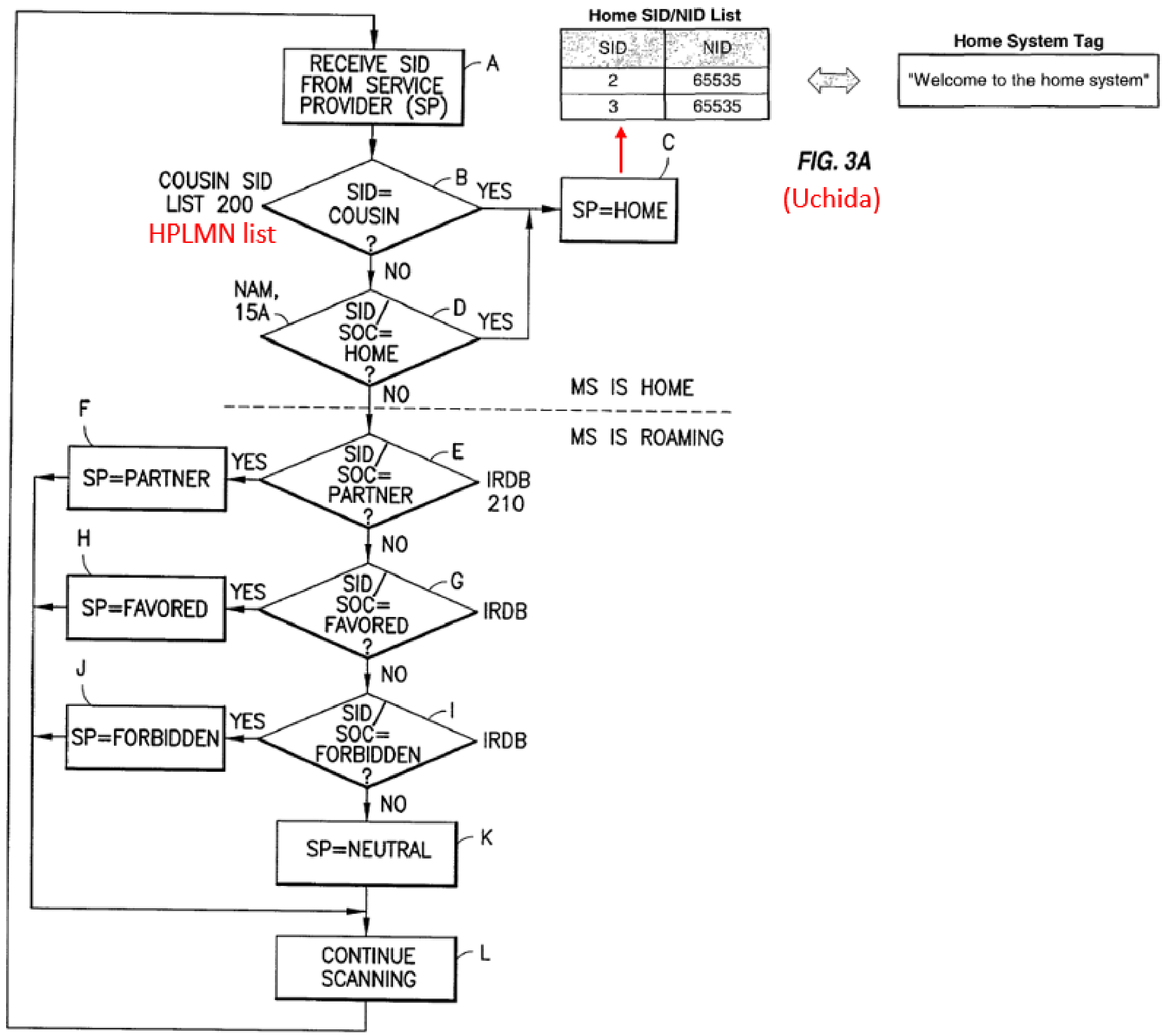


FIG. 3A (Uchida)

FIG.4B (McElwain)

296. McElwain discloses "provid[ing] a visual or other display to the user to inform the user of the current service provider status," but it does not provide an exhaustive disclosure of how to determine the content of the visual display. *See id.* ¶ 54. In my opinion, a POSITA would have understood that Uchida discloses one beneficial way of determining the content of the visual display that is compatible with McElwain. For example, following selecting and registering with a network,

the system would first determine whether to display the home system tag by comparing the identifier of the selected network (MCC/MNC pair) with the "Home SID/NID List" (*i.e.*, HPLMN list) disclosed in Uchida. Uchida (Ex. 1005) ¶¶ 37, 80, 81, Figs. 3A, 7. The "Home SID/NID List" (*i.e.*, HPLMN list) would contain at least the MCC/MNC pairs from the Cousin SID list (*i.e.*, HPLMN list), each of which is associated with the home service provider. *See* McElwain (Ex. 1004) ¶ 46. That is, the SIDs in the Cousin SID list (*i.e.*, HPLMN list) would each be associated with the same "Home System Tag," which is displayed if the mobile station connects with any network on the Cousin SID list. A POSITA would understand that this combination would result in an effective way to inform a subscriber whether he or she is on a "home network" or on a roaming network incurring additional charges.

297. A POSITA would have been motivated to make this combination. For example, both references disclose systems and methods for determining whether a mobile station is at home or roaming and displaying an appropriate visual indication. Furthermore, as explained above, McElwain identifies a need to appropriately display to a subscriber whether he or she is roaming because roaming may incur additional charges. *See, e.g.*, McElwain (Ex. 1004) ¶¶ 18, 55. Uchida discloses one known, advantageous method of determining the content of the visual display. The method of Uchida is compatible with McElwain, as shown conceptually in the figure above.

298. In my opinion, the proposed combination of McElwain and Uchida would have been nothing more than the combination of prior art elements (the use of an HPLMN list, such as McElwain's Cousin SID list, and Uchida's Home SID/NID List, which causes the display of the same home system tag for all home networks) according to known methods (using the MCC/MNC pairs in McElwain's Cousin SID list for the Home SID/NID List, and adapting McElwain's mobile station so that, when the MCC/MNC of the current network matches an MCC/MNC pair in Home SID/NID List, the home network name is displayed, and otherwise displaying an alternate name to indicate roaming) to yield predictable results (displaying the same home network name for any of the home networks in McElwain's Cousin SID list, otherwise displaying a roaming network name).

299. A POSITA would have had a reasonable expectation of success in implementing this combination because it is a simple and effective way to inform a subscriber whether he or she is on a "home network" or on a roaming network incurring additional charges. Creating a "Home SID/NID List" (*i.e.*, HPLMN list) comprising the MCC/MNC pairs in the HPLMN list (*i.e.*, Cousin SID list), and then comparing the selected MCC/MNC pair with that list to display the home network name if there is a match, or a different network name if there is no match, would have been a predictable, straightforward application of known techniques.

b. McElwain and Hicks

300. In my opinion, a POSITA would have been motivated to combine McElwain and Hicks. Specifically, a POSITA would have used the method of determining which service provider information to display as taught in Hicks, with McElwain's system and method for selection and registration. In one implementation of the combined system, following the selection and registration with a network as taught in McElwain, the mobile station would compare a selected MCC/MNC pair with a list of MCC/MNC pairs in an OPL file, as taught in Hicks. The OPL file would contain all of the "home" networks in McElwain's Cousin SID list (*i.e.*, the recited HPLMN list), with each such code pointing to the "home" network name in the PNN file, resulting in the display of the same home network name. Hicks (Ex. 1006) at 2:3-10, 2:46-63. If a match is found, the mobile station displays the home network name; if there is no match, the system displays a different, "roaming" network name, as taught in Hicks.

301. More specifically, McElwain teaches "provid[ing] a visual or other display to the user to inform the user of the current service provider status." McElwain (Ex. 1004) ¶ 54. In my opinion, a POSITA would have understood that one beneficial way to determine what to display would be to, following selection of a network from the Cousin SID list (*i.e.*, HPLMN list), use OPL and PNN files as disclosed in Hicks. *See* Hicks (Ex. 1006) at 2:3-10, 2:46-63. The OPL file would

comprise each of the networks identified in the Cousin SID list (*i.e.*, HPLMN list) pointing to the same alphanumeric tag in the PNN file. *See* Hicks (Ex. 1006) at 2:3-10, 2:46-63.

302. For example, if the Cousin SID list (*i.e.*, HPLMN list) contained ten MCC/MNC pairs, ten of the entries in the OPL file of Figure 3 in Hicks would correspond to those MCC/MNC pairs, with each pointing to "HOME" in the PNN file. Thus, if the mobile station selects and registers on a network corresponding to any of those ten MCC/MNC pairs, the mobile station would display the home network name. The MCC/MNC pairs in the IRDB 210 (*i.e.*, the Partner and Favored networks) would also be included in the OPL file but each would point to a display name in the PNN file other than "HOME."

303. Thus, in the combined system, following the selection and registration with a network as taught in McElwain, the mobile station would compare the selected PLMN (MCC/MNC pair) with a list of MCC/MNC pairs in an OPL file, as taught in Hicks. Hicks (Ex. 1006) at 2:11-24, 2:46-3:13. The OPL file would contain all of the "home" networks in McElwain's Cousin SID list (*i.e.*, the recited HPLMN list), with each such code pointing to the "home" network name in the PNN file, as taught in Hicks. When a match is found, the mobile station would display the home network name; if there is no match, the system would display a different, "roaming" network name, as taught in Hicks. *Id.*

304. A POSITA would have been motivated to make the combination as described above. For example, both references disclose systems and methods for determining whether a mobile station is at home or roaming and displaying an appropriate visual indication, and thus, are in the same field of endeavor. Indeed, both references identify a need to appropriately display to a subscriber whether he or she is roaming because roaming may incur additional charges. *See, e.g.*, McElwain (Ex. 1004) ¶¶ 18, 55; Hicks (Ex. 1006) at 3:14-22. The combination of McElwain and Hicks addresses this need.

305. The proposed combination of McElwain and Hicks would have been nothing more than the combination of prior art elements (the use of an HPLMN list, such as McElwain's Cousin SID list, and Hicks's OPL file with multiple MCC/MNC pairs pointing to the same "home network" in the PNN file) according to known methods (using the MCC/MNC pairs in McElwain's Cousin SID list to populate the MCC/MNC pairs in Hicks's OPL file pointing to the "home" network display name in a PNN file, and adapting McElwain's mobile station so that, when the MCC/MNC of the current network matches an MCC/MNC pair in Home SID/NID List, the home network name is displayed, and otherwise displaying an alternate name to indicate roaming) to yield predictable results (displaying the same home network name for any of the home networks in McElwain's Cousin SID list).

306. In my opinion, a POSITA would have had a reasonable expectation of success in implementing this combination. It is a predictable, straightforward method of informing a subscriber whether he or she is on a "home network" or on a roaming network incurring additional charges. OPL and PNN files were known at the time of the '933 patent, and using them to display the same network name for multiple HPLMNs would have been a predictable, straightforward application of known techniques.

c. McElwain, Uchida, and Hicks

307. A POSITA would have been motivated to combine Hicks with McElwain and Uchida. A POSITA would start with the combination of McElwain and Uchida (*see* Section IX.A.2.a), and then additionally use LAC data, as taught in Hicks, in addition to PLMN data (MCC/MNC pairs) in comparing and identifying the network name to display, as taught in McElwain and Uchida.

308. A POSITA would have been motivated to make this combination. For example, all three references disclose systems and methods for determining whether a mobile station is at home or roaming and displaying an appropriate visual indication. The embodiments in McElwain and Uchida use SIDs to identify system providers. McElwain (Ex. 1004) ¶ 40; Uchida (Ex. 1005) ¶ 6. McElwain further teaches that "any suitable identifier may be used," such as "the GSM equivalent of the SID, called the Public Land Mobile Network (PLMN) identity." McElwain

(Ex. 1004) ¶ 40; Uchida (Ex. 1005) ¶ 92. Hicks describes its embodiments with reference to both MCC/MNC pairs *and* Location Area Codes (LACs). Hicks (Ex. 1006) at 2:29-39. Hicks explains that "[t]he LAC identifier in the present invention refers to the ability of a mobile network to subdivide and identify its coverage area into location areas." *Id.* at 2:36-39. The additional use of LAC where PLMNs are used, as disclosed in Hicks, allows a mobile network provider additional granularity in subdividing a network. Indeed, as I explain above, the idea of using location areas (identified by location area codes or LACs) to subdivide networks was a very well known aspect of GSM technology, dating back to at least the early 1990s. *See* Section VI.C.2.

309. The proposed combination would have been nothing more than the simple substitution of one known element (the use of LAC identifiers, in addition to MCC/MNC pairs, in determining which network name to display, as taught in Hicks) for another element (using MCC/MNC pairs in determining which network name to display, as taught in McElwain) to obtain predictable results (displaying of the same network name, even where a single network is subdivided into location areas, as taught in Hicks). A POSITA would have had a reasonable expectation of success in implementing this combination because it is a simple and effective way to determine which network name to display when a mobile network is subdivided into location

areas, as was known in the art. There is no more difficulty in using an LAC identifier in addition to MCC/MNC pairs as there is in using just MCC/MNC pairs.

3. Specific Grounds of Invalidity

a. Ground 1: Claims 1-3, 6-8, 11-13 & 19 Would Have Been Obvious Over McElwain

310. I have analyzed claims 1-3, 6-8, 11-13 and 19 and conclude that they would have been obvious over McElwain. I provide a detailed analysis of each claim limitation below.

(i) Elements 1[pre], 6[pre], 11[pre] & 19[pre]

1[pre]: "A network name displaying method in a mobile station, the method comprising"

6[pre]: "A mobile station, comprising"

11[pre]: "A computer program product, comprising"

19[pre]: "A network name displaying method in a mobile station, the method comprising"

311. It is my opinion that McElwain discloses these limitations expressly or inherently or they it would have been obvious to a POSITA.

312. I understand that, generally, preambles are not limiting. To the extent the any of the preambles of the respective claims above is limiting, McElwain discloses the elements in any such preambles. McElwain discloses a "mobile station." McElwain (Ex. 1004) ¶ 33. McElwain also discloses a network name displaying method by disclosing that the mobile station "provide[s] a visual or other display to the user to inform the user of the current service provider status." *Id.* ¶ 54,

Figs. 1-2. Furthermore, McElwain's mobile station includes a computer program product (*e.g.*, memories 12 and 12A) storing "instructions that controls the operation of processor 170." *Id.* ¶ 33. In my opinion, a POSITA would understand these instructions to comprise a computer program that is embodied in a computer program product as required by claim 11. Thus, McElwain discloses a "network name displaying method," a "mobile device," and a "computer program product" that is recited in the preambles.

(ii) Elements 1[a], 6[a], 11[d] & 19[a]

1[a]: "scanning to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area"

6[a]: "a transceiver being operative to scan to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area"

11[d]: "causing a scanning process to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area"

19[a]: "scanning to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within coverage area"

313. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

314. McElwain discloses scanning "to receive a plurality of [MCC/MNC] pairs." McElwain discloses a mobile station 10 that includes a wireless transceiver, comprised of a transmitter 20 and a receiver 22, that can "tune to different frequency channels when scanning and otherwise acquiring service." *Id.* ¶ 37. As part of the scanning process, "the mobile station 10 receives a SID." *Id.* ¶ 48. As I've discussed above in Section VI.A, a SID is a fifteen-digit system identification code. *Id.* ¶ 40. The examples in the figures of McElwain use SIDs, but McElwain expressly discloses that "any suitable identifier may be used." *Id.* As I've explained in Section VI.A.5, one specific alternative is the Public Land Mobile Network (PLMN), which is "the GSM equivalent of the SID." *Id.* Additionally, in my opinion, a POSITA would have known that a PLMN is identified by an MCC/MNC pair that corresponds to a wireless communication network. *See* Section VI.A.5. In my opinion, a POSITA would have understood that the scanning process is caused by the computer instructions stored on a computer medium as required by claim 11. *See* McElwain (Ex. 1004) ¶ 24 ("The foregoing methods may be practiced by supplying program instructions readable by a machine. The program instructions are stored in one or more program storage devices."). Thus, McElwain teaches scanning and receiving MCC/MNC pairs.

315. In my opinion, a POSITA would have understood that McElwain's mobile station receives a plurality of MCC/MNC pairs, each corresponding to a

plurality of wireless communication networks within a coverage area. In Figure 5, McElwain shows that a plurality of SIDs (networks) may be available in a single coverage area—*i.e.*, the area labeled "overlap." *Id.* ¶ 47, Fig. 5. McElwain further teaches that "scanning may be continuous," and in my opinion, a POSITA would understand that to mean the mobile station continuously receives MCC/MNC pairs of wireless communication networks in a coverage area, until the mobile station locates one that is a "home" network, or it is determined that no "home" network is available. *Id.* ¶ 49. Thus, McElwain teaches that the plurality of MCC/MNC pairs correspond to a plurality of wireless communication networks within a coverage area.

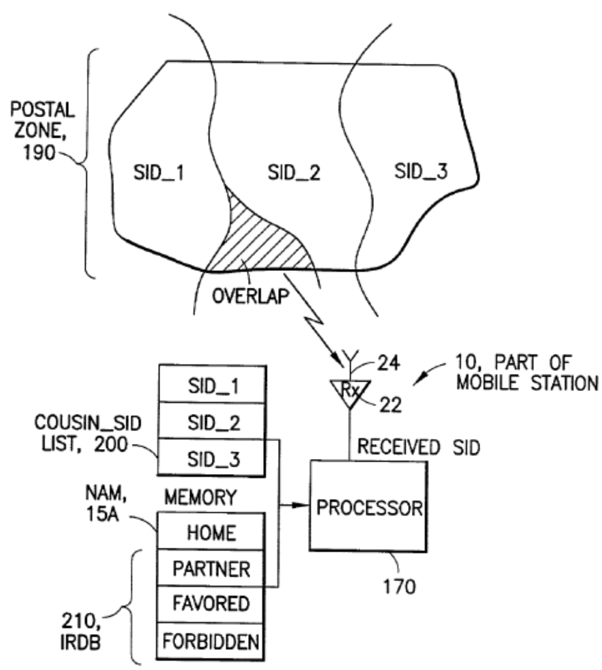


FIG.5

(iii) Element 6[b]

6[b]: "a Subscriber Identity Module (SIM) interface for receiving a SIM"

316. It is my opinion that McElwain discloses this limitation expressly or inherently or it would have been obvious to a POSITA.

317. McElwain discloses a SIM interface for receiving a SIM. McElwain states that its mobile station comprises "non-volatile memory 12A which may be embedded or which may be removable, such as a removable Subscriber Identification Module (SIM)." *Id.* ¶ 33. In my opinion, a POSITA would have understood that a removable SIM requires an interface for receiving the SIM, *i.e.*, that the presence of "a Subscriber Identity Module (SIM) interface for receiving a SIM" must exist in McElwain's mobile station by virtue of disclosing that a mobile device can use a removable SIM. At a minimum, because McElwain discloses a *removable* SIM, I believe that it would have been obvious to a POSITA to design the mobile station with an interface for receiving the SIM, which would have been within his skill set, given the ubiquity of SIM cards. *Id.*

(iv) Elements 11[a] & 11[b]

11[a]: "a computer storage medium"

11[b]: "computer instructions stored on the computer storage medium"

318. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

319. McElwain's mobile station includes a computer storage medium (*e.g.*, memories 12 and 12A) storing "instructions that controls the operation of processor 170." *Id.* In my opinion, a POSITA would understand these instructions to comprise computer instructions as required by claim 11.

(v) Elements 6[c] & 11[c]

6[c]: "a processor being operative to"

11[c]: "the computer instructions being executable by a processor for executing the steps of"

320. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

321. McElwain's mobile station includes a "[p]rocessor 170" and digital signal processor 18. *Id.* ¶¶ 33-34, Figs. 1-2, 5. Furthermore, memories 12 and 12A in McElwain's mobile station store "instructions that controls the operation of processor 170." *Id.* ¶ 33. The processor executes these instructions to accomplish the steps of claims 6 and 11. *See id.*

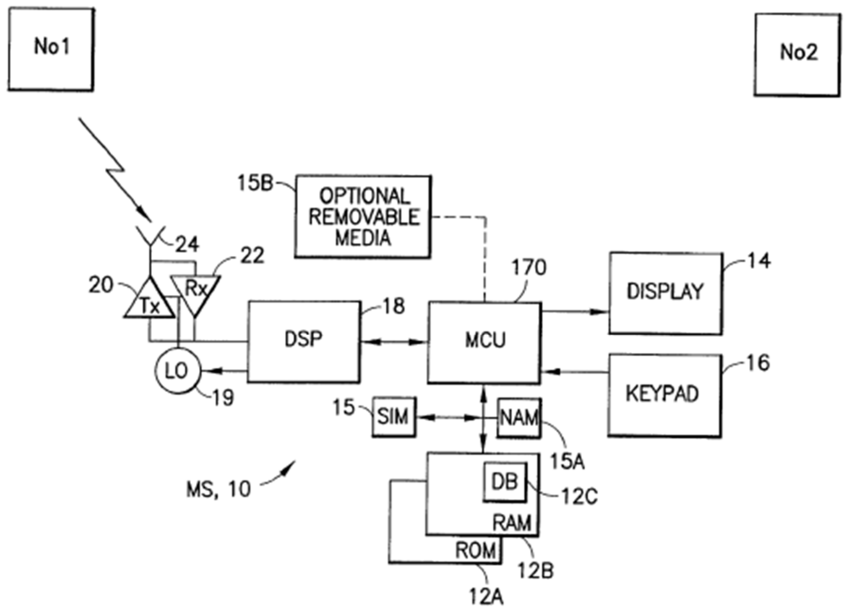


FIG.2

(vi) Elements 1[b], 6[d], 11[e] & 19[b]

1[b]: **"selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list"**

6[d]: **"select and register with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of Preferred PLMN (PPLMN) list"**

11[e]: **"selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PLMN) list"**

19[b]: "selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list"

322. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

323. McElwain teaches that after the mobile station receives a SID from a service provider, it "first determines if the received SID" (MCC/MNC pair in the PLMN example) "is found in the Cousin SID list 200." *Id.* ¶ 50, Fig. 4B. McElwain teaches that if it is "affirmative," "control passes to Step C to declare the service provider to be the Home service provider of the mobile station 10." *Id.* ¶ 50, Fig. 4B.

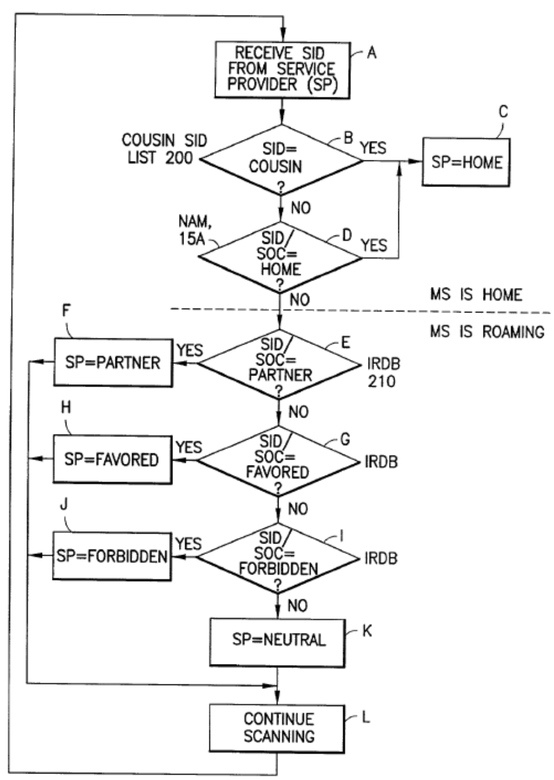


FIG.4B

324. The SIDs in the Cousin SID can represent a plurality of networks belonging to one service provider, each of which is considered a "home" network. For example, as explained in McElwain, "[i]f the received SID matches any one of the stored SIDs in the Cousin SID list 200, the mobile station 10 . . . makes the determination that the category of the associated service provider is a Home service provider, and that the mobile station 10 is not roaming." *Id.* ¶ 46. A POSITA would have understood that the "Cousin" designation, when a subscriber is operating in prepaid mode, would include both the "home" network and all networks equivalent to the home network. For at least prepaid mode, the Cousin SID list would include *all* MCC/MNC codes for home networks. Thus, the Cousin SID list is a Home Public Land Mobile Network (HPLMN) list, and the HPLMN is given preference.

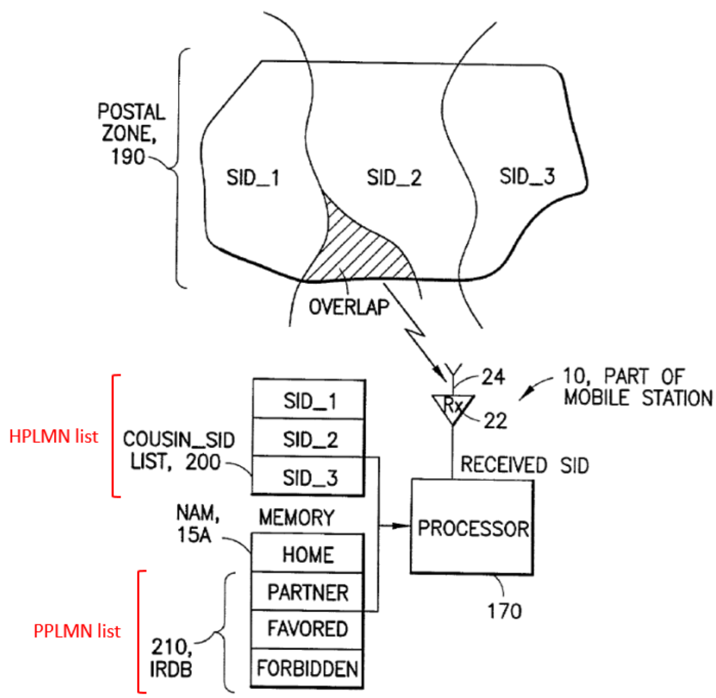


FIG.5

325. In my opinion, a POSITA would have understood that once a match is made with a network in the Cousin SID list, the mobile station 10 will select and register with that network. For example, McElwain states that it pertains "to methods and apparatus for the mobile station to select a particular wireless service provider from which service is to be obtained." *Id.* ¶ 3. Moreover, the process of Figures 4A and 4B is practiced by the mobile station at "initial turn-on or during system scanning," meaning that the mobile station has not yet connected with a network. *Id.* ¶ 48. McElwain further refers to the process of comparing MCC/MNC pairs with the Cousin SID list as "system selection." *Id.* ¶ 52; *see also id.* ¶ 12 ("The mobile station is enabled to identify and select its home system when it is encountered."), 37, 59. In my opinion, a POSITA would have understood this disclosure to mean that the mobile station selects and registers with a wireless communication network.

326. If there is not a match with an MCC/MNC pair in the HPLMN list (*i.e.*, Cousin SID list), then the mobile station checks the conventional intelligent roaming database (IRDB) table 210 for, *e.g.*, a "Partner" SID or "Favored" SID. *Id.* ¶¶ 49, 50, Fig. 4B. In my opinion, a POSITA would have understood that the IRDB acts as a Preferred PLMN (PPLMN) list. Because the mobile station compares received network codes first with the Cousin SID list (*i.e.*, HPLMN list) and then with the IRDB table (*i.e.*, PPLMN list), there is a preference to home networks of the

HPLMN list over non-home networks of a PPLMN list. *See id.* Fig. 4B. McElwain also discloses that "[t]he mobile station 10 preferably gives priority in system selection for the SIDs that reside in the cousin SID list 200." *Id.* ¶ 52. This preference is shown in the flow chart of Figure 4B, with the comparison to the Cousin SID list (*i.e.*, HPLMN list) in Step B, which is always performed, and the comparisons with the IRDB list (*i.e.*, PPLMN list) in Steps E, G and I, which are performed following Step B, if at all:

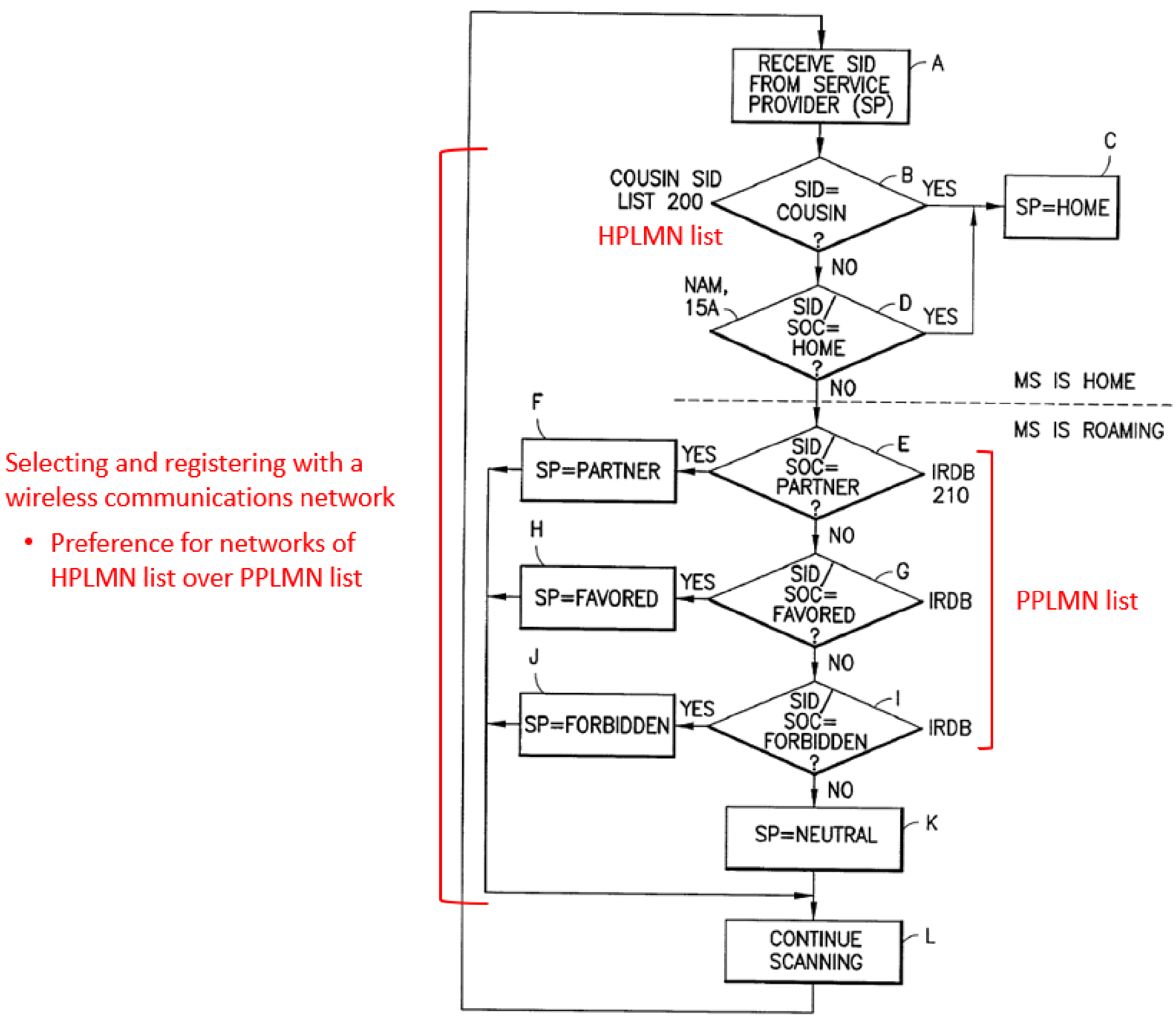


FIG.4B

327. To the extent the Patent Owner contends that the Cousin SID list is not an HPLMN list because it does not contain the SID from NAM 15A, I disagree. In my opinion, a POSITA would have understood that when operating in prepaid mode, the Cousin SID list contains *all* of the networks considered to be home networks. *See* McElwain ¶ 46 ("If the received SID matches any one of the stored SIDs in the Cousin SID list 200, the mobile station 10, when operating in the prepaid mode, makes the determination that the category of the associated service provider is a Home service provider, and that the mobile station 10 is not roaming."). In any event, it additionally would have been obvious to include the SID stored in NAM 15A in the Cousin SID list as well, to create a single list of "home" networks, or to simply consider the Cousin SID list and the SID stored in NAM 15A collectively as an HPLMN list, since they contain preferred home networks and are prioritized ahead of the roaming networks. The combination of the Cousin SID list and NAM 15A would also be considered to be an HPLMN list.

(vii) Elements 1[c], 6[e] & 11[f]

1[c]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks of the HPLMN list"

6[e]: "compare the MCC and MNC pair of the selected network with a plurality of home network NICC[17] and MNC pairs corresponding to the home networks of the HPLMN list and associated with a home network display name"

11[f]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks in the HPLMN and associated with a home network display name"

328. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

329. As I've explained above, according to McElwain, after the mobile station receives a SID from a service provider, it "first determines if the received SID" (MCC/MNC pair) "is found in the Cousin SID list 200" (*i.e.*, HPLMN list). *Id.* ¶¶ 50-51, Fig. 4B. As explained in McElwain, "[i]f the received SID matches any one of the stored SIDs in the Cousin SID list 200, the mobile station 10 . . . makes the determination that the category of the associated service provider is a Home service provider, and that the mobile station 10 is not roaming." *Id.* ¶ 46. The SIDs in the Cousin SID represent a plurality of networks belonging to one service provider, each of which is considered a "home" network. Thus, the mobile station compares the MCC/MNC pair of the selected network with a plurality of home

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[17] For purposes of this Declaration, I am interpreting "NICC" as a typographical error. I am assuming it has the same meaning as "MCC."

network MCC/MNC pairs in the HPLMN list (*i.e.*, Cousin SID list) as required by the claim.

330. McElwain teaches that each MCC/MNC pair in the Cousin SID list is associated with a home network display name. McElwain teaches, for example, that when comparing an MCC/MNC pair with the Cousin SID list, "[a]n affirmative identification results in the SP [service provider] being identified as in the HOME category." *Id.* ¶ 52. "[T]he mobile station 10 may provide a visual or other display to the user to inform the user of the current service provider status." *Id.* ¶ 54. Because the service provider was already determined to be "home," in my opinion, a POSITA would have understood this to teach displaying a home network display name for any of the selected home networks in the Cousin SID list. *See infra* Section IX.A.3.a(ix). In my opinion, it would have been obvious to a POSITA based on McElwain alone to compare the selected MCC/MNC pair with a plurality of home network MCC and MNC pairs corresponding to the home networks of the HPLMN list (*i.e.*, Cousin SID list).

331. In my opinion, a process with a single comparison of an MCC/MNC pair with the HPLMN list can satisfy both the "selecting . . . giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list" limitation (*e.g.*, 1[b]) and the "comparing the MCC and MNC pair" limitation (*e.g.*, 1[c]). To the extent it does not, it would have been obvious to a POSITA to make a second

comparison between the selected MCC/MNC pair and the Cousin SID list in order to determine if the "home" network name should be displayed. McElwain disclsoses a need to "provide a visual display or other display to the user to inform the user of the current service provider status." McElwain (Ex. 1004) ¶ 54. To achieve this, because there are multiple HPLMNs, it would have been obvious to use the Cousin SID list to determine if the home network name should be displayed.

332. Additionally, I believe that a POSITA would have known and had a reasonable expectation of success in using the known "Enhanced Operator Named String" procedure in the "Description of the Related Art" in the '933 patent. '933 patent (Ex. 1001) at 2:8-20. The '933 patent states that "instead of displaying a name that is different from that of the home network in the above-scenario, the same or substantially similar 'home network' name may be displayed even though a different network is actually being used." *See id.* In my opinion, a POSITA would have understood that this procedure worked by comparing a PLMN (MCC/MNC pair) with a list of PLMNs that correspond to the same "Service Provider Name."

(viii) Elements 1[d], 6[f] & 11[g]

1[d]: "for the step of comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) in the comparing step based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station in the comparing step"

6[f]: **"for the comparison: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on the SIM for the comparison based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station for the comparison"**

11[g]: **"for the comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) for the comparing based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station for the comparing"**

333. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

334. As I've explained above, in selecting a network to which to connect, McElwain discloses that the mobile station compares the received network identifier with the home networks in the HPLMN list (*i.e.*, Cousin SID list). *See* Section IX.A.1.a. As also explained above, McElwain teaches a comparison of a selected network with the home networks in the HPLMN list (*i.e.*, Cousin SID list) which are associated with a home network name. *See id.* McElwain discloses that the Cousin SID list can be stored in either a SIM or in the memory of the mobile station: "[A] retailer that sells the prepaid service provider's mobile stations 10 may program the Cousin SID list 200 . . . directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the

customer along with the mobile station 10." McElwain (Ex. 1004) ¶ 39. McElwain also discloses that one example of a "removable card" is a SIM card. For example, McElwain states that "[a] separate removable SIM 15 can be provided as well, the SIM storing, for example, subscriber-related information." *Id.* ¶ 38. Or it "may be stored on another type of removable media 15B, such as a card containing memory." *Id.*

335. Additionally, in my opinion, removable SIM cards were ubiquitous and it would have been obvious to a POSITA in light of McElwain alone to store any data structures related to which service provider name to display in a removable SIM card or in the memory of the mobile station. It was well known at the time of the '933 patent that SIM cards were one of the most common locations to store subscriber information, including lists of networks for subscribers. *See* Section VI.B.1. A POSITA would have understood that there were a finite, small number of places to store such lists of networks, including principally the SIM card, the internal memory of the mobile station, or some other removable media. A device would have to start looking in one of these places for an HPLMN list and thus starting in any of these places would have been obvious to a POSITA. As explained above (*see* Section VI.B.1), a SIM card often contains data related to a particular subscriber and the allowable networks and services for that subsciber. Thus, a POSITA would have

been motivated to program the device to check the SIM card first, which is the most likely location for the "home" networks for that subscriber.

336. Therefore, to the extent this limitation requires *first* checking the SIM card for the HPLMN list and *then*, if not on the SIM card, checking the mobile station's memory for the HPLMN list, in my opinion, it would have been obvious to a POSITA to program the mobile station to check for the HPLMN list by first checking the SIM card and then, if not on the SIM card, checking the mobile station's memory. Applying such known techniques would have yielded predictable results, with a reasonable expectation of success.

(ix) Elements 1[e], 6[g], 11[h] & 19[c]

1[e]: **"causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"**

6[g]: **"cause the home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"**

11[h]: **"causing the home network display name which is the same for all home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC am MNC pair of the selected network and one of the home network MCC and MNC pairs"**

19[c]: "causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network, and one of the home network MCC and MNC pairs"

337. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

338. McElwain teaches identifying a match between the MCC/MNC pair and one of the home network MCC/MNC pair. In McElwain, each MCC/MNC pair in the Cousin SID list is associated with a home network display name. McElwain teaches, for example, that "[i]f the received SID matches any one of the stored SIDs in the Cousin SID list 200, the mobile station 10 . . . makes the determination that the category of the associated service provider is a Home service provider, and that the mobile station 10 is not roaming." *Id.* ¶ 46. McElwain later reiterates that when comparing an MCC/MNC pair with the Cousin SID list, "[a]n affirmative identification results in the SP [service provider] being identified as in the HOME category." *Id.* ¶ 52; *see also id.* ¶ 50 (stating an affirmative identification passes to the step "to declare the service provider to be the Home service provider" of the mobile station).

339. McElwain also discloses displaying a service provider name. According to McElwain, "the mobile station 10 may provide a visual or other display to the user to inform the user of the current service provider status." *Id.* ¶ 54.

Because the service provider was already determined to be "home" network, in my opinion, a POSITA would have understood this to teach displaying a home network display name for all of the home networks in the Cousin SID list. For example, in the pseudocode following Paragraph 54, there is a single alphatag for all "Cousin" SIDs (*i.e.*, "Home" PLMN list), which would thus be a "home" network display name when operating in prepaid mode. *See id.*

```
/* giving category information to the UI based on what alphatag is shown
by UI
(names here are CS specific, UI uses own naming convention)*/
.UI_NOT_ROAMING /* Home */
.UI_NOT_ROAMING_PREPAID /* Cousin */
.UI_NOT_ROAMING_HOME_TYPE /* Partner */
.UI_ROAMING_SEMI_NON_HOME_TYPE /* Favored */
.UI_ROAMING_NON_HOME_TYPE /* Neutral */
```

340. A POSITA would have understood that the "Cousin" designation, when a subscriber is operating in prepaid mode, would include both the "home" network and all networks equivalent to the home network. Thus, for at least prepaid mode, the Cousin SID list would include *all* MCC/MNC codes for home networks.

341. To the extent this limitation is not expressly or inherently disclosed in McElwain, in my opinion, it would have been obvious to a POSITA in light of McElwain alone, and a POSITA would have had a reasonable expectation of success in implementing the system in McElwain as described above. As explained above, the invention in McElwain is motivated by the goal of appropriately displaying to a subscriber whether he or she is roaming because roaming may incur additional charges. *See, e.g.*, *id.* ¶¶ 18, 55. For example, McElwain states that "[a] need also

exists to avoid roaming charges when a customer . . . operates within a geographical area that was designated by the prepaid wireless communications system provider as being the customer's home area." *Id.* ¶ 18. To serve these goals, I believe that a POSITA would have been motivated to display to the subscriber the same home network name for *any* of the networks on the Cousin SID list that the service provider considers to be part of the subscriber's home network. The subscriber would know, based on the display of a home network name, whether he or she is incurring undesirable roaming charges. Therefore, in my opinion, a POSITA would reasonably expect that displaying the same network name for the networks on the Cousin SID would help a subscriber to know his or her roaming status.

(x) Elements 1[f], 6[h], 11[i] & 19[d]

1[f]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

6[h]: "otherwise cause an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

11[i]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

19[d]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

342. It is my opinion that McElwain discloses these limitations expressly or inherently or they would have been obvious to a POSITA.

343. McElwain discloses that "mobile station 10 may provide a visual or other display to the user to inform the user of the current service provider status." *Id.* ¶ 54. As shown in Figure 4B in McElwain, if there is no match in Steps B and D (*e.g.*, with the Cousin SID list), "then the mobile station 10 can be assumed to not be located in the geographical region defined by, for example, the postal zone 190 (*i.e.*, the mobile station 10 is roaming)." *Id.* ¶ 49. According to McElwain, if the mobile station determines that it is roaming, as shown in the pseudo-code below Paragraph 54, it displays an alternate name on the visual display (*e.g.*, "Favored" or "Neutral").

344. To the extent McElwain does not explicitly disclose these elements, in my opinion, they would have been obvious to a POSITA in light of McElwain alone. McElwain emphasizes that "airtime charges when the mobile station is roaming are customarily higher than when it is operating within its home network." *Id.* ¶ 55. I believe that a POSITA would thus have been motivated to provide a way for the mobile subscriber to know that he or she is roaming, which could and would be accomplished by displaying an alternate display name than the one displayed for home networks.

345. In my opinion, a POSITA would have understood that there are at least two easily implementable ways to indicate to a mobile subscriber that he or she is roaming: the first is to display an alternate network name (as recited in the claims) and the second is to display some other sort of roaming indicator (such as an icon on the display screen). Indeed, as I explain above, roaming indicators were well known in the art. Section VI.D. It would have been obvious for a POSITA to try both types of roaming indicators, even together, to ensure that the subscriber is aware of his or her roaming status. Thus, it would have been obvious to cause an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC/MNC pair of the selected network and the home network MCC/MNC pairs. In my opinion, a POSITA would have had a reasonable expectation that using this method would successfully alert a subscriber when he or she is roaming and incurring extra charges.

(xi) Claims 2, 7 & 12

2: "The method of claim 1, wherein the plurality of home network MCC and MNC pairs are stored in the SIM."

7: "The mobile station of claim 6, wherein the plurality of home network MCC and MNC pairs are stored on the SIM."

12: "The computer program product of claim 11, wherein the plurality of home network MCC and MNC pairs are stored in the SIM."

346. It is my opinion that McElwain discloses these claims expressly or inherently or they would have been obvious to a POSITA.

347. McElwain discloses that the Cousin SID list (*i.e.*, HPLMN list that contains the home network MCC/MNC pairs) can be stored in either a SIM or in the memory of the mobile station. Specifically, McElwain discloses: "[A] retailer that sells the prepaid service provider's mobile stations 10 may program the Cousin SID list 200 . . . directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the customer along with the mobile station 10." *Id.* ¶ 39. Elsewhere in the disclosure, McElwain clarifies that one example of a "removable card" is a SIM card. For example, McElwain states that "[a] separate removable SIM 15 can be provided as well, the SIM storing, for example, subscriber-related information." *Id.* ¶ 38.

(xii) Claims 3 & 13

3: **"The method of claim 1, wherein the plurality of home network MCC and MNC pairs are stored in the memory of the mobile station."**

13: **"The computer program product of claim 11, wherein the plurality of home network MCC and MNC pairs are stored in the memory of the mobile station."**

348. It is my opinion that McElwain discloses these claims expressly or inherently or they would have been obvious to a POSITA.

349. McElwain discloses that the Cousin SID list (HPLMN list that contains the home network MCC/MNC pairs) can be stored in either a SIM or in the memory of the mobile station. Specifically, McElwain discloses: "[A] retailer that sells the prepaid service provider's mobile stations 10 may program the Cousin SID list 200

… directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the customer along with the mobile station 10." *Id.* ¶ 39.

(xiii) Claim 8

8: "The mobile station of claim 6, wherein the memory is separate and apart from the SIM in the mobile station."

350. It is my opinion that McElwain discloses this claim expressly or inherently or it would have been obvious to a POSITA.

351. In McElwain, there is memory separate and apart from the SIM in the mobile station. For example, McElwain discloses memory 12, such as read-only memory 12A and random access memory 12B. *See id.* ¶¶ 37-38. McElwain then states that "[a] separate removable SIM 15 can be provided as well." *Id.* ¶ 38. Thus, in my opinion, a POSITA would have understood that the memory in McElwain's mobile station is separate and apart from the SIM.

b. Ground 2: Claims 1-3, 6-8, 11-13 & 19 Would Have Been Obvious Over McElwain in Combination with Uchida

352. I have analyzed claims 1-3, 6-8, 11-13 and 19 and conclude that they would have been obvious over McElwain in combination with Uchida. I provide a detailed analysis of each claim limitation below.

353. In my opinion, claims 1-3, 6-8, 11-13 and 19 would have been obvious over McElwain, but to the extent it is determined that McElwain does not disclose specific elements of claims 1, 6, 11, or 19, then the following discussion analyzes

where Uchida teaches these elements. McElwain discloses all of the remaining elements of claims 1-3, 6-8, 11-13 and 19.

(i) Elements 1[c], 6[e] & 11[f] in McElwain-Uchida

1[c]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks of the HPLMN list"

6[e]: "compare the MCC and MNC pair of the selected network with a plurality of home network NICC[18] and MNC pairs corresponding to the home networks of the HPLMN list and associated with a home network display name"

11[f]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks in the HPLMN and associated with a home network display name"

354. It is my opinion that the combination of McElwain with Uchida renders these limitations obvious to a POSITA.

355. The system in Uchida "maintains a list of one or more home systems, with each home system being identified by its unique (SID, NID) pair. The system can then determine whether or not it is in communication with a home system based on its home (SID, NID) pairs and the (SID, NID) pair received from a serving system." Uchida (Ex. 1005) ¶ 6. This is shown in Figure 3A, which has a "Home

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[18] For purposes of this Declaration, I am interpreting "NICC" as a typographical error. I am assuming it has the same meaning as "MCC."

SID/NID List" containing a list of SID/NID combinations that correspond to the same "Home System Tag." *Id.* ¶ 37, Fig. 3A.

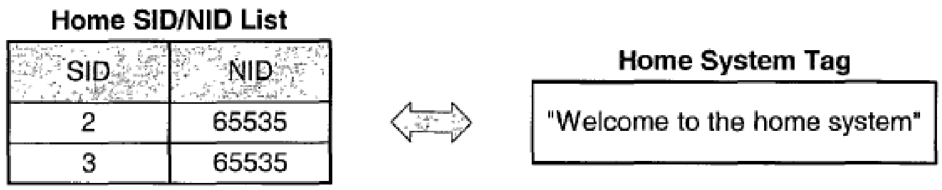

FIG. 3A

356. Figure 7 is a flow diagram showing the process for displaying the proper system tag. *Id.* ¶ 23. In Figure 7, once service is obtained, "[a] determination is then made whether or not the serving system is a home system for the terminal (step 730). This determination may be made based on the home SID/NID list for the terminal and the (SID, NID) pair for the serving system." *Id.* ¶ 81, Fig. 7. Uchida teaches that "[i]f the serving system is a home system, then the home system tag is displayed (step 732) and the process then terminates." *Id.* ¶ 8.

357. In my opinion, it would have been obvious for a POSITA to determine the network name to display in McElwain by using Uchida's "Home SID/NID List" and the process described with respect to Figure 7. *See* Section IX.A.2.a. Specifically, a POSITA would use the MCC/MNC pairs in McElwain's Cousin SID list of "home" networks to generate the "Home SID/NID List" for purposes of the comparison and home name display taught by Uchida. Each of those networks is declared to be a "home" network by its inclusion in the Cousin SID list. *See*

McElwain (Ex. 1004) ¶ 52. Thus, they would each be associated with the same "Home System Tag," which is displayed if the mobile station connects with any network on the Cousin SID list. *See generally* Uchida (Ex. 1005) ¶¶ 78-83, Fig. 7.

358. The comparison of the selected PLMN (MCC/MNC pair) with the home network MCC/MNC pairs in the Home SID/NID List occurs after a network is selected from the HPLMN list (*i.e.*, Cousin SID list), as shown below. In my opinion, a POSITA would have understood that, when combined with McElwain, the MCC/MNC pairs of the HPLMN list (*i.e.*, Cousin SID list) of McElwain would be used for the Home SID/NID List. Thus, following selection and registration, to determine what network name should be displayed, the selected MCC/MNC pair would be compared with a plurality of home network MCC/MNC pairs corresponding to the home networks of the HPLMN list.

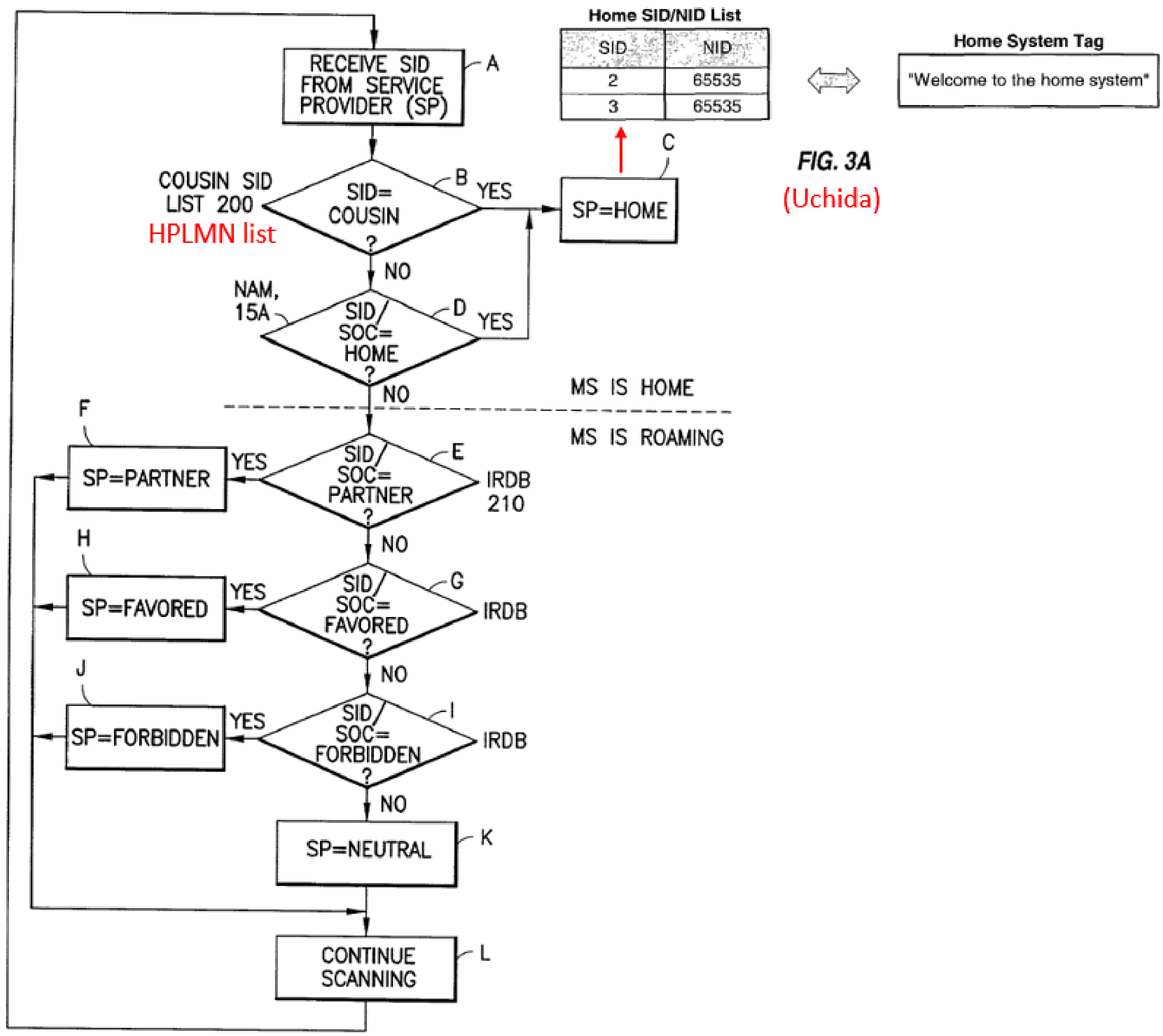

FIG.4B (McElwain)

(ii) Elements 1[e], 6[g], 11[h] & 19[c] in McElwain-Uchida

1[e]: **"causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"**

6[g]: **"cause the home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"**

11[h]: **"causing the home network display name which is the same for all home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC am MNC pair of the selected network and one of the home network MCC and MNC pairs"**

19[c]: **"causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network, and one of the home network MCC and MNC pairs"**

359. It is my opinion that the combination of McElwain with Uchida renders these limitations obvious to a POSITA.

360. As explained above, Uchida discloses an embodiment in which the mobile terminal "maintains a list of one or more home systems, with each home system being identified by its unique (SID, NID) pair." *Id.* ¶ 6. As shown in Figure 3A, the "Home SID/NID List" contains a list SID/NID combinations and a "Home System Tag." *Id.* ¶ 37, Fig. 3A. "The home system tag is displayed by the terminal whenever it receives service from any one of the systems included in the home SID/NID list." *Id.*

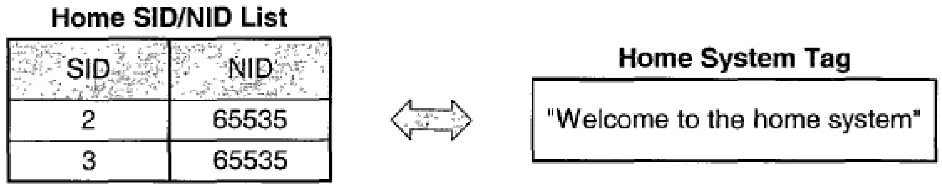

FIG. 3A

361. As shown and described with respect to Figure 7, once service is obtained, "[a] determination is then made whether or not the serving system is a home system for the terminal (step 730). This determination may be made based on the home SID/NID list for the terminal and the (SID, NID) pair for the serving system." *Id.* ¶ 81, Fig. 7. According to Uchida, "[i]f the serving system is a home system, then the home system tag is displayed (step 732) and the process then terminates." *Id.* However, "if the serving system is not a home system (step 730) a determination is made whether or not the SID of the serving system is one of the SID values covered by the specific tag list (step 740)." *Id.* ¶ 82. If it is, "then the specific tag associated with the SID value for the serving system is displayed." *Id.*

362. In my opinion, it would have been obvious to a POSITA to determine the network name to display with the system and method disclosed in McElwain by using the "Home SID/NID List" in Uchida. Because they are declared to be "home" networks by their inclusion in the Cousin SID list (*see* McElwain (Ex. 1004) ¶ 52), each of the networks in the Cousin SID list would be in the Home SID/NID List of Uchida. Therefore, the SIDs in the Cousin SID list would each be associated with

the same "Home System Tag," which is displayed if the mobile station connects with any network on the Cousin SID list.

(iii) Elements 1[f], 6[h], 11[i] & 19[d] in McElwain-Uchida

1[f]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

6[h]: "otherwise cause an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

11[i]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

19[d]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

363. It is my opinion that the combination of McElwain with Uchida renders these limitations obvious to a POSITA.

364. In Uchida, when the mobile station obtains service, it first determines "whether or not the serving system is a home system for the terminal" using the home SID/NID list. Uchida (Ex. 1005) ¶ 81. "If the serving system is a home system, then the home system tag is displayed (step 732) and the process then terminates." *Id.* However, "if the serving system is not a home system (step 730) a determination is made whether or not the SID of the serving system is one of the SID values

covered by the specific tag list (step 740).” *Id.* If it is, “then the specific tag associated with the SID value for the serving system is displayed (step 742).” *Id.* An example of the specific tag list is shown in Figure 3C. *See id.* Fig. 3C. Each of the specific tags corresponds to a “roaming system,” and the tag is displayed along with a “roaming display indication.” *Id.* ¶ 40.

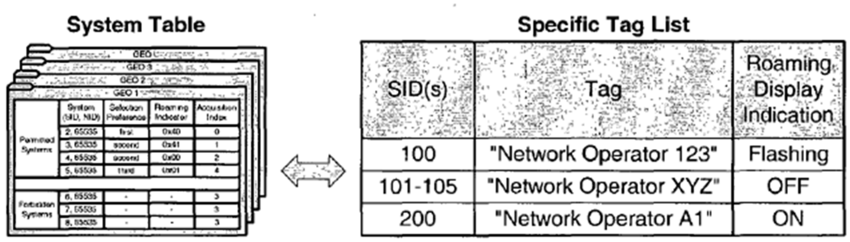

FIG. 3C

365. The specific tag list shown in Figure 3C are the alternate display names that are visually displayed. Thus, in McElwain-Uchida, these alternate display names (such as the names in the specific tag list) are only displayed if it is determined the system is not on a “home” network. This means that there would have been no match between the MCC/MNC pair of the selected network and the home network MCC/MNC pairs (*e.g.*, the SIDs from McElwain’s Cousin SID list).

c. Ground 3: Claims 4, 9, 14 Would Have Been Obvious Over McElwain in Combination with Uchida and Hicks

(i) Claims 4, 9 & 14 in McElwain-Uchida-Hicks

4: “The method of claim 1, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.”

9: “The mobile station of claim 6, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.”

14: “The computer program product of claim 11, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.”

366. I have analyzed claims 4, 9 and 14 and conclude that they would have been obvious over McElwain in combination with Uchida and Hicks.

367. As explained above, all of the features of the independent claims are disclosed in the combination of McElwain and Uchida. Additionally, as explained herein, the feature of claims 4, 9, and 14 is disclosed in Hicks. *See* Section IX.A.1.c.

368. The embodiments in McElwain use SIDs “to uniquely identify the home service provider for the unit,” which were known and used in North American cellular systems. McElwain (Ex. 1004) ¶ 40. McElwain further teaches that “any suitable identifier may be used,” such as “the GSM equivalent of the SID, called the Public Land Mobile Network (PLMN) identity.” *Id.*

369. Hicks explains that the mobile device receives “control data including PLMN (Public Land Mobile Network) data and LAI (Location Area Information) data.” Hicks (Ex. 1006) at 2:28-34. PLMN data “is a composite of an MCC/MNC identifier.” *Id.* at 2:32. LAI data “is a composite of the PLMN data and an LAC (Location Area Code) identifier.” *Id.* at 2:33-34. For example, in the embodiment shown in Figure 3, Hicks makes a comparison based on “Location Area

Information" (LAI)—a combination of an MCC/MNC pair and a LAC—to determine whether the mobile station is on a home or roaming network.[19] *Id.* at 2:64-13, Fig. 3. In Figure 3, Hicks shows the OPL file with the complete LAI (including PLMN and LAC) in determining whether a network is a home network. *Id.* at Fig. 3.

370. In my opinion, it would have been obvious to use the combination of PLMN and LAC data in the system and method in McElwain (including when McElwain is combined with Uchida). Hicks explains that "[t]he LAC identifier in the present invention refers to the ability of a mobile network to subdivide and identify its coverage area into location areas." *Id.* at 2:36-39. I believe that a POSITA would have been motivated to use the LAC identifier, as taught in Hicks, in McElwain-Uchida in comparing and identifying the network name to display and to further subdivide its coverage area where necessary. For example, Hicks explains that the MCC/MNC pair for Raleigh, North Carolina, is 310-150, but that this same PLMN "includes a large geographical area, including Charlotte and Atlanta, among other locations in the southeastern USA." *Id.* at 1:13-17. Using LACs, a provider could designate only portions of that large geographical area to be the "home"

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[19] In this context, Hicks is using "home or roam" as would be understood by a user, not as used in the network's organization of MCC/MNC/LAI.

network for certain subscribers, using different display names for that other cities in that same geographical area, *i.e.*, within the same MCC/MNC. Indeed, as I explain above, the idea of using location areas (identified by location area codes or LACs) to subdivide networks was a very well known aspect of GSM technology, dating back to at least the early 1990s. *See* Section VI.C.2, VI.C.3.

d. Ground 4: Claims 1-4, 6-9, 11-14 & 19 Would Have Been Obvious Over McElwain in Combination with Hicks

371. I have analyzed claims 1-4, 6-9, 11-14 and 19 and conclude that they would have been obvious over McElwain in combination with Hicks. I provide a detailed analysis of each claim limitation below.

372. In my opinion, claims 1-3, 6-8, 11-13 and 19 would have been obvious over McElwain, but to the extent it is determined that McElwain does not disclose specific elements of claims 1, 6, 11, or 19, then the following discussion analyzes where Hicks teaches these elements. I also discuss where Hicks teaches the elements of dependent claims 4, 9 and 14. McElwain discloses all of the remaining elements of claims 1-4, 6-9, 11-14 and 19, as explained above. Section IX.A.3.a.

(i) Elements 1[c], 6[e] & 11[f] in McElwain-Hicks

1[c]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks of the HPLMN list"

6[e]: "compare the MCC and MNC pair of the selected network with a plurality of home network NICC[20] and MNC pairs corresponding to the home networks of the HPLMN list and associated with a home network display name"

11[f]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks in the HPLMN and associated with a home network display name"

373. It is my opinion that the combination of McElwain with Hicks renders these limitations obvious to a POSITA.

374. Hicks discloses comparing a selected PLMN (MCC/MNC pair) with an OPL file having multiple PLMNs, each with a pointer to an alphanumeric tag in a PNN file. Hicks (Ex. 1006) at 2:3-10, 2:46-63, Fig. 2. In my opinion, a POSITA would have understood that an OPL file for the system in McElwain would contain at least the MCC/MNC pairs in the Cousin SID list (HPLMN list). *Id.* Thus, following selection and registration, to determine what network should be displayed, the selected MCC/MNC pair would be compared with a plurality of home network MCC/MNC pairs corresponding to the home networks of the HPLMN list. *Id.* at 2:64-3:2; *see also* Section IX.A.2.b.

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[20] For purposes of this Declaration, I am interpreting "NICC" as a typographical error. I am assuming it has the same meaning as "MCC."

(ii) **Elements 1[e], 6[g], 11[h] & 19[c] in McElwain-Hicks**

1[e]: **"causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"**

6[g]: **"cause the home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"**

11[h]: **"causing the home network display name which is the same for all home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC am MNC pair of the selected network and one of the home network MCC and MNC pairs"**

19[c]: **"causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network, and one of the home network MCC and MNC pairs"**

375. It is my opinion that the combination of McElwain with Hicks renders these limitations obvious to a POSITA

376. Hicks teaches that a mobile phone contains an Operator PLMN List (OPL) file having multiple PLMNs, each with a pointer to an alphanumeric tag in a PLMN Network Name (PNN) file. *Id.* at 2:3-10. The mobile phone checks the received PLMN information against the OPL file. *Id.* at 2:47-56. If the PLMN in the OPL file points to the first PNN record, it is determined to be a "home network."

Id. at 2:56-63. If not, the PLMN is determined to be a roaming network. *Id.* at 2:63. Thus, for any of the PLMNs contained in the OPL file that point to the first record in the PNN file, the PLMN is a "home" network and the home network name stored in the PNN file is displayed. *Id.* at 3:6-22.

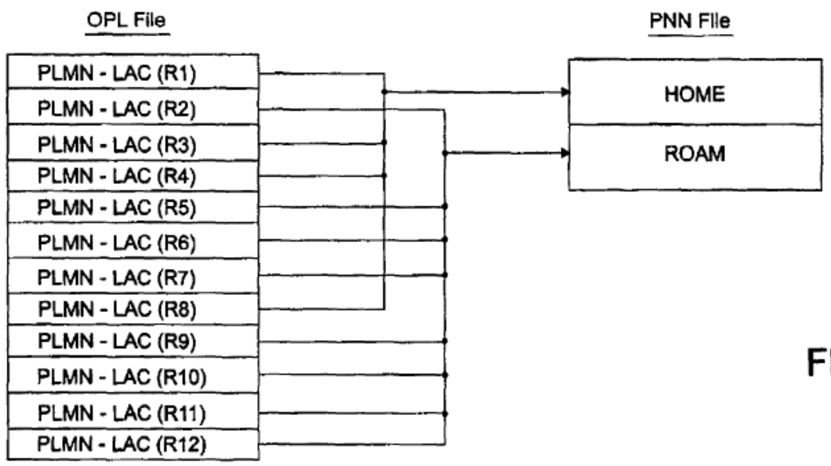

FIG. 3

377. In my opinion, it would have been obvious to a POSITA to determine the network name to display with the system and method disclosed in McElwain by using an OPL file with pointers to a PNN file, as is done in Hicks. Because they are declared to be "home" networks by their inclusion in the Cousin SID list (*see* McElwain (Ex. 1004) ¶ 52), each of the networks in the Cousin SID list would be in the OPL file and point to the first alphanumeric tag in the PNN file in McElwain-Hicks. *See* Hicks (Ex. 1006) at 2:3-10, 2:64-3:13.

(iii) Elements 1[f], 6[h], 11[i] & 19[d] in McElwain-Hicks

1[f]: "otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"

6[h]: **"otherwise cause an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

11[i]: **"otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

19[d]: **"otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

378. It is my opinion that the combination of McElwain with Hicks renders these limitations obvious to a POSITA.

379. Hicks discloses in its implementation of the OPL and PNN files that if a PLMN code does not correspond to the "Home" alphanumeric tag in the PNN file, it corresponds to the alternate "Roam" tag. Hicks (Ex. 1006) at 2:46-3:22, Figs. 2-3. Thus, in McElwain-Hicks, if a selected MCC/MNC pair in the OPL file corresponds with anything but the first entry in the PNN file or is not in the OPL file, the system would connect to a "roaming" network and display the alternate "Roam" tag for the subscriber. *Id.* at 2:19-24, 2:46-3:22.

(iv) Claims 4, 9 & 14 in McElwain-Hicks

4: **"The method of claim 1, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying."**

9: “The mobile station of claim 6, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.”

14: “The computer program product of claim 11, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.”

380. It is my opinion that McElwain in combination with Hicks renders these claims obvious to a POSITA.

381. The embodiments in McElwain use SIDs “to uniquely identify the home service provider for the unit,” which were known and used in North American cellular systems. McElwain (Ex. 1004) ¶ 40. McElwain further teaches that “any suitable identifier may be used,” such as “the GSM equivalent of the SID, called the Public Land Mobile Network (PLMN) identity.” *Id.*

382. Hicks describes its embodiments with reference to “PLMN data,” which “is a composite of an MCC/MNC identifier.” Hicks (Ex. 1006) at 2:32. Hicks further explains that control data for connecting with mobile networks can include a “LAC (Location Area Code) identifier.” *Id.* at 2:33-34. For example, in the embodiment shown in Figure 3, Hicks makes a comparison based on “Location Area Information” (LAI), which is a combination of PLMN data (MCC/MNC pair) and a LAC to determine whether the mobile station is on a home or roaming network. *Id.* at 3:6-13, Fig. 3. In Figure 3, Hicks shows the OPL file with the complete LAI

(including PLMN and LAC) in determining whether a network is a home network. *Id.* at Fig. 3.

383. In my opinion, it would have been obvious to use the combination of PLMN and LAC data in the system and method in McElwain. For example, Hicks explains that "[t]he LAC identifier in the present invention refers to the ability of a mobile network to subdivide and identify its coverage area into location areas." *Id.* at 2:36-39. I believe that a POSITA would have been motivated to use the LAC identifier in McElwain to further subdivide its coverage area where necessary. Indeed, as I explain above, the idea of using location areas (identified by location area codes or LACs) to subdivide networks was a very well-known aspect of GSM technology, dating back to at least the early 1990s. *See* Section VI.C.

B. Grounds of Invalidity Based on 3GPP Standards

1. Overview of Prior Art References

384. I have reviewed the 3GPP TS 23.122 V5.2.0 ("TS-23.122") (Ex. 1007), which is a Technical Specification that was published by 3GPP in 2003 and was publicly available on the 3GPP file server no later than December 18, 2002. I understand that TS-23.122 is available as prior art as of the date of publication.

385. I have reviewed the 3GPP TS 22.101 V5.8.0 ("TS-22.101"), which is a Technical Specification that was published by 3GPP in 2002 and was publicly

available on the 3GPP file server no later than December 17, 2002. I understand that TS-22.101 is available as prior art as of the date of publication.

386. I have reviewed the 3GPP TS 31.102 V5.3.0 ("TS-31.102"), which is a Technical Specification that was published by 3GPP in 2003 and was publicly available on the 3GPP file server no later than January 2, 2003. I understand that TS-31.102 is available as prior art as of the date of publication.

387. The public 3GPP standards describe an apparatus and method for displaying the home network name for multiple home networks. These features are described in at least three 3GPP standards: TS-23.122, TS-22.101, and TS-31.102 (collectively, "3GPP Standards"). TS-23.122 describes the tasks undertaken by a mobile station (sometimes abbreviated as an "MS") when in idle mode—*i.e.*, when switched on but not yet connected to a network. TS-23.122 (Ex. 1007) at 5. As explained in TS-23.122, "[w]hen an MS is switched on, it attempts to make contact with a public land mobile network (PLMN)." *Id.* at 8. "The MS looks for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel." *Id.*

388. There are several data fields stored in the SIM of the mobile station relevant to selecting and registering on a PLMN, including the "HPLMN Selector with Access Technology," "User Controlled PLMN Selector with Access Technology," and "Operator Controlled PLMN Selector with Access Technology."

See id. at 13. The details of these data fields are included in TS-31.102, which I describe below.

389. The HPLMN Selector with Access Technology ("HPLMN Selector"), as shown below, includes a list of PLMN codes (MCC/MNC codes) corresponding to the home network. TS-31.102 (Ex. 1009) at 54. It "allow[s] provision for multiple HPLMN codes." TS-23.122 (Ex. 1007) at 13. It additionally includes "[t]he Access Technology of the HPLMN that the ME[21] will assume when searching for the HPLMN, in priority order." TS-31.102 (Ex. 1009) at 54. For example, the HPLMN Selector may list one MCC/MNC pair as the "1st PLMN (highest priority)," followed by "UTRAN" as the "1st PLMN Access Technology Identifier." The list may then include the same MCC/MNC pair, followed by a different access technology identifier (*e.g.*, GERAN). *Id.*

390. Alternatively, the "2nd PLMN" can be a second MCC/MNC pair that is considered a "home" network, followed by its preferred access technology. *Id.* The HPLMN Selector can include up to n PLMNs, each of which is a "home" network. TS-31.102 (Ex. 1009) at 54. Thus, the HPLMN Selector corresponds to the claimed "HPLMN list."

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[21] "ME" in the 3GPP Standards refers to "Mobile Equipment," which is the same as a mobile station (or "MS"). TS-22.101 (Ex. 1008) at 8.

4.2.54 $EF_{HPLMNwAcT}$ (HPLMN selector with Access Technology)

The HPLMN Selector with access technology data field shall contain the HPLMN code, or codes together with the respected access technology in priority order (see TS 23.122 [31]).

Identifier: '6F62'		Structure: Transparent		Optional
SFI: '13'				
File size: 5n (n ≥ 1) bytes		Update activity: low		
Access Conditions: READ PIN UPDATE ADM DEACTIVATE ADM ACTIVATE ADM				

Bytes	Description	M/O	Length
1 to 3	1st PLMN (highest priority)	M	3 bytes
4 to 5	1st PLMN Access Technology Identifier	M	2 bytes
6 to 8	2nd PLMN	O	3 bytes
9 to 10	2nd PLMN Access Technology Identifier	O	2 bytes
:	:		
(5n-4) to (5n-2)	nth PLMN (lowest priority)	O	3 bytes
(5n-1) to 5n	nth PLMN Access Technology Identifier	O	2 bytes

391. Next, the mobile station includes a "User Controlled PLMN Selector with Access Technology" ("User PLMN Selector") on its SIM. TS-23.122 (Ex. 1007) at 13. The User PLMN Selector "contains the coding for n PLMNs," which are "determined by the user and defines the preferred PLMNs of the user in priority order." TS-31.102 (Ex. 1009) at 17. TS-23.122 also describes this as "a list of 'equivalent PLMNs.'" TS-23.122 (Ex. 1007) at 13. Like the HPLMN Selector, the User PLMN Selector contains the access technology for each PLMN. TS-31.102 (Ex. 1009) at 17. The User PLMN Selector is a Preferred PLMN (PPLMN) list as claimed in the '933 patent.

4.2.5 $EF_{PLMNwAcT}$ (User controlled PLMN selector with Access Technology)

This EF contains the coding for n PLMNs, where n is at least eight. This information is determined by the user and defines the preferred PLMNs of the user in priority order. The first record indicates the highest priority and the n[th] record indicates the lowest. The EF also contains the Access Technologies for each PLMN in this list. (see TS 23.122 [31])

Identifier: '6F60'	Structure: transparent		Optional
SFI: '0A'			
File size: 5n (where n ≥8 bytes)	Update activity: low		
Access Conditions: READ PIN UPDATE PIN DEACTIVATE ADM ACTIVATE ADM			

Bytes	Description	M/O	Length
1 to 3	1st PLMN (highest priority)	M	3 bytes
4 to 5	1st PLMN Access Technology Identifier	M	2 bytes
6 to 8	2nd PLMN	M	3 bytes
9 to 10	2nd PLMN Access Technology Identifier	M	2 bytes
:	:		
36 to 38	8th PLMN	M	3 bytes
39 to 40	8th PLMN Access Technology Identifier	M	2 bytes
41 to 43	9th PLMN	O	3 bytes
44 to 45	9th PLMN Access Technology Identifier	O	2 bytes
:	:		
(5n-4) to (5n-2)	Nth PLMN (lowest priority)	O	3 bytes
(5n-1) to 5n	Nth PLMN Access Technology Identifier	O	2 bytes

392. The "Operator Controlled PLMN Selector with Access Technology" ("Operator PLMN Selector") is also a PPLMN list. It is similar to the User PLMN Selector except that it is defined by the operator rather than the user. TS-31.102 (Ex. 1009) at 53.

4.2.53 EF$_{OPLMNwACT}$ (Operator controlled PLMN selector with Access Technology)

This EF contains the coding for n PLMNs where n is determined by the operator. This information is determined by the operator and defines the preferred PLMNs in priority order. The first record indicates the highest priority and the nth record indicates the lowest. The EF also contains the Access Technologies for each PLMN in this list. (see TS 23.122 [31])

Identifier: '6F61'	Structure: transparent		Optional
SFI: '11'			
File size: 5n (where n ≥8 bytes)	Update activity: low		
Access Conditions: READ PIN UPDATE ADM DEACTIVATE ADM ACTIVATE ADM			

Bytes	Description	M/O	Length
1 to 3	1st PLMN (highest priority)	M	3 bytes
4 to 5	1st PLMN Access Technology Identifier	M	2 bytes
:	:		
36 to 38	8th PLMN	M	3 bytes
39 to 40	8th PLMN Access Technology Identifier	M	2 bytes
41 to 43	9th PLMN	O	3 bytes
44 to 45	9th PLMN Access Technology Identifier	O	2 bytes
:	:		
(5n-4) to (5n-2)	Nth PLMN (lowest priority)	O	3 bytes
(5n-1) to 5n	Nth PLMN Access Technology Identifier	O	2 bytes

393. According to TS-23.122, the "PLMN/access technology combinations are listed in priority order." TS-23.122 (Ex. 1007) at 13. Section 4.4 of TS-23.122 describes the process of selecting and registering on a PLMN. *Id.* According to TS-23.122:

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN (if not previously selected);

ii) each PLMN in the "User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iii) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

v) other PLMN/access technology combinations in order of decreasing signal quality.

Id. at 14.

394. TS-23.122 Section 4.4 discloses multiple potential processes for selecting and registering on a PLMN, including a process in which the HPLMN Selector is used as an HPLMN list. In a first process, the mobile station compares received MCC/MNC pairs with a single HPLMN code included in the SIM. TS-23.122 (Ex. 1007) at 13-14. The mobile station searches for the HPLMN using the access technologies in the HPLMN Selector "in priority order." *Id.* at 14-15. If a received MCC/MNC pair matches the HPLMN and associated access technology, the mobile station "attempts registration." *Id.* at 13. If the HPLMN is not available using any prescribed access technologies, the mobile station then compares received MCC/MNC codes with "each PLMN in the 'User Controlled PLMN Selector with Access Technology' data field in the SIM (in priority order)." *Id.* at 14. If this comparison is not successful, the mobile station then compares the received MCC/MNC codes with "each PLMN in the 'Operator Controlled PLMN Selector with Access Technology' data field in the SIM (in priority order)." *Id.* at 14. If a successful registration on one of these PLMNs is achieved, "the MS indicates the selected PLMN." *Id.* at 15.

395. TS-23.122 also teaches that in a subsequent version of the 3GPP standards, the selection and registration process would use the HPLMN Selector as an HPLMN list. Specifically, TS-23.122 states:

> To allow provision for multiple HPLMN codes, the HPLMN access technologies are stored on the SIM together with PLMN codes. This version of the specification does not support multiple HPLMN codes and the "HPLMN Selector with Access Technology" data field is only used by the MS to get the HPLMN access technologies.

TS-23.122 (Ex. 1007) at 13. By stating that "***[t]his version of the specification***" does not support this feature, TS-23.122 teaches to a POSITA that the HPLMN Selector could be used, and was intended to be used, in future versions of the standard as an HPLMN list for selection and registration. *Id.* A POSITA would have understood that the exact structure disclosed in this version of the 3GPP Standards (*e.g.*, the HPLMN Selector) would be used as a list of HPLMNs given preference over any of the PLMNs in the User and Operator PLMN Selectors. *Id.* at 14.

396. To the extent Patent Owner contends that the HPLMN Selector is not an HPLMN list, I disagree for the reasons above. In any event, in my opinion, it also would have been obvious to a POSITA to modify the selection and registration algorithm disclosed in TS-23.122 to compare received MCC/MNC codes with all HPLMNs listed in the HPLMN Selector, because HPLMN lists were well known in the art when the application for the '933 patent was filed, and had been used in cellular systems already. At the time the '933 patent was filed, it was already common for network operators to own and operate multiple networks. *See* Section VI.C.5. Therefore, I believe a POSITA would have been motivated to use

the HPLMN Selector as an HPLMN list, for example, where a network operator was operating multiple networks (each with a unique MCC/MNC code) in a single geographic area. Indeed, the 3GPP Standards, as described above, disclose that it would be possible and useful to use the HPLMN Selector as an HPLMN list during network selection and registration.

397. The 3GPP Standards also disclose displaying the same home network display name for all home networks. As mentioned above, once the mobile station selects and registers with a PLMN, the mobile station indicates [*i.e.*, displays] the selected PLMN." TS-23.122 (Ex. 1007) at 15. There are various methods in the 3GPP Standards for determining what to display with respect to a network name.

398. For example, TS-22.101 describes procedures for determining which PLMN identification to display. Annex A.3 explains that "[i]t shall be possible to store on the USIM at least 10 PLMN Identifications . . . for which the same PLMN name shall be displayed." TS-22.101 (Ex. 1008) at 28. Annex A.4 additionally provides that a "service provider name is stored in the USIM in text and/or optionally graphic format." *Id.* As with the PLMN name, "[i]t shall be possible to associate at least 10 PLMN Identifications . . . with the same SP Name" (*i.e.*, Service Provider Name). *Id.* When registered on any of the these 10 PLMN identifications, "[t]he SP Name shall be displayed." *Id.* The PLMN Name (which is the same for at least 10 PLMN identifications) can also be optionally displayed. *Id.*

399. TS-31.102 shows some data structures used to display the same home network name for multiple PLMNs. First, Section 4.2.12 of TS-31.102 shows the "Service Provider Name" storage. TS-31.102 (Ex. 1009) at 23.

4.2.12 EF_{SPN} (Service Provider Name)

This EF contains the service provider name and appropriate requirements for the display by the ME.

Identifier: '6F46'	Structure: transparent		Optional
File Size: 17 bytes		Update activity: low	
Access Conditions: READ ALWAYS UPDATE ADM DEACTIVATE ADM ACTIVATE ADM			

Bytes	Description	M/O	Length
1	Display Condition	M	1 byte
2 to 17	Service Provider Name	M	16 bytes

- Display Condition
  Contents: display condition for the service provider name in respect to the registered PLMN (see TS 22.101[24]).

400. Second, Section 4.2.66 shows the "Service Provider Display Information," which "contains a list of n PLMNs in which the Service Provider Name shall be displayed." *Id.* at 63-64.

4.2.66 EF_{SPDI} (Service Provider Display Information)

This EF contains information regarding the service provider display i.e. the service provider PLMN list.

Identifier: '6FCD'	Structure: transparent		Optional
SFI: '1B'			
File size: x bytes		Update activity: low	
Access Conditions: READ PIN UPDATE ADM DEACTIVATE ADM ACTIVATE ADM			

Bytes	Description	M/O	Length
1 to x	TLV object(s) containing Service Provider information	M	x bytes

Tag Value	Tag Description
'A3'	Service provider display information Tag
'80'	Service provider PLMN list tag

401. The data structures in Sections 4.2.58 and 4.2.59 in TS-31.102 are also relevant to displaying the same home network name for multiple PLMNs. These are shown below. First, Section 4.2.58 is a data structure called the "PLMN Network Name." TS-31.102 (Ex. 1009) at 58. It "contains the full and short form versions of the network name for the registered PLMN." *Id.* There are multiple networks names in this list—the first is the default network name when registered to the HPLMN and the rest are names for other networks (MCC/MNC combinations). *Id.* TS-31.102 instructs that the names in this list (which is stored on the SIM) are to be used before any of the names stored in the internal memory of the mobile device. *Id.*

4.2.58 EF_{PNN} (PLMN Network Name)

This EF contains the full and short form versions of the network name for the registered PLMN. The ME shall use these versions in place of its own versions of the network name for the PLMN (stored in the ME's memory list), and also in place of the versions of the network name received when registered to the PLMN, as defined by TS 24.008 [9].

The first record in this EF is used for the default network name when registered to the HPLMN. Subsequent records are to be used for other network names.

Identifier: '6FC5'	Structure: linear fixed		Optional
SFI: '19'			
Record length: X bytes; X ≥ 3	Update activity: low		
Access Conditions: READ ALWAYS UPDATE ADM ACTIVATE ADM DEACTIVATE ADM			
Bytes	**Description**	**M/O**	**Length**
1 to X	Network name TLV objects	M	X bytes

- Network name TLV objects.
  The content and coding (Full name for network and Short name for network) is defined below, where the fields within the objects are defined in TS 24.008[9]:

TS-31.102 (Ex. 1009) at 58. Thus, multiple MCC/MNC pairs in the Operator PLMN List can point to a single "home" network name in the PLMN Network Name list.

402. Section 4.2.59 describes an "Operator PLMN List" that contains a list of Location Area Identities (LAIs) (each containing an MCC/MNC pair) with pointers to specific network names in the PLMN Network Name list (Section 4.2.58). TS-31.102 (Ex. 1009) at 59. The Operator PLMN List "contains a prioritised list of Location Area Information (LAI) identities that are used to associate a specific operator name contained in [the PLMN Network Name list] with the LAI." *Id.* The value associated with each entry in the Operator PLMN List "indicates the record number in [the PLMN Network Name list] that shall be displayed as the registered PLMN name.

4.2.59 EF_{OPL} (Operator PLMN List)

This EF contains a prioritised list of Location Area Information (LAI) identities that are used to associate a specific operator name contained in EF_{PNN} with the LAI. The ME shall use this EF in association with the EF_{PNN} in place of any network name stored within the ME's internal list and any network name received when registered to the PLMN, as defined by TS 24.008 [9].

If the EF_{PNN} is not present then this file shall not be present.

Identifier: '6FC6'		Structure: linear fixed		Optional
SFI: '1A'				
Record length: X bytes, X >= 8		Update activity: low		
Access Conditions: READ ALWAYS UPDATE ADM DEACTIVATE ADM ACTIVATE ADM				
Bytes	Description		M/O	Length
1 to 7	Location Area Identity		M	7 bytes
8	PLMN Network Name Record Identifier		M	1 byte

- Location Area Identity

  Contents:
  Location Area Information, this comprises of the MCC, MNC and LAC

TS-31.102 (Ex. 1009) at 59.

403. As noted above, the PLMN Network Name list will contain at least one entry for the name designated for the "HPLMN"—the "home" network. Multiple LAIs in the Operator PLMN List can point to that record, meaning that a single "home" network name in the PLMN Network Name list can be associated with *any* networks in the Operator PLMN List considered to be a "home" network. It is my opinion that it would have been obvious to a POSITA to associate *all* home network MCC/MNC pairs in the HPLMN Selector with the same home network name in the PLMN Network Name list. This is especially the case given the teachings in Annex A.3 of TS-22.101 regarding associating multiple PLMN records with the same display name.

404. It is therefore my opinion that the 3GPP Standards disclose or render obvious the allegedly inventive aspects of the '933 patent.

405. Given the focus of the 3GPP Standards, they can be silent on the features of the mobile station, such as its processor, memory, and SIM interface. However, in my opinion, implementing the features from the 3GPP standards described above would require at least one processor, memory, and a SIM interface in the mobile station. At a minimum, it would have been obvious to a POSITA that these components would be included in the mobile station.

2. Motivations to Combine

a. Reasons to Combine the 3GPP Standards

406. In my opinion, the relevant 3GPP Standards constitute one reference as they all cover relevant aspects of the same system. To the extent, however, that they are considered to be different references, a POSITA would have been motivated to combine these three 3GPP Standards. All three standards are directed to the same field of invention, namely communications within a GSM packet-switched mobile telecommunications system. All three are part of the same 3GPP standards release (Release 5) and describe aspects of the same GSM cellular system. Because of the technical complexity of cellular systems, 3GPP publishes the standard specifications across multiple documents, each specifying different aspects of the same system. Furthermore, TS-23.122 explains that its purpose is to outline[] how the requirements of the 22 series Technical Specifications . . . on idle mode operation shall be implemented."). TS-23.122 (Ex. 1007) at 5. Therefore, these references are explicitly intended to be read and considered together.

407. In my opinion, a POSITA would have known (or at least have found it obvious) to read all three documents describing different aspects of the same GSM cellular system alongside each other and combine their teachings as intended.

b. Reasons to Combine 3GPP Standards and McElwain

408. A POSITA would have been motivated to look at references relating to cellular communications to describe features of a mobile station.

409. A POSITA would have been motivated to use an HPLMN list (like the Cousin SID list in McElwain) for the purpose of prioritized network selection and registration, described in the 3GPP Standards, as well as for determining which network name to display based on the selected network. *See* TS-23.122 (Ex. 1007) at 13-15; TS-31.102 (Ex. 1009) at 54. As explained above, the 3GPP Standards disclose an HPLMN Selector that allows multiple PLMN codes (*i.e.*, HPLMN list). TS-31.102 (Ex. 1009) at 54. McElwain likewise teaches using a "Cousin SID list" (*i.e.*, HPLMN list) in the selection and registration process. McElwain (Ex. 1004) ¶¶ 46, 49-50, 52. In my opinion, a POSITA would have been motivated to use the HPLMN Selector in the 3GPP Standards in the same way McElwain uses the Cousin SID list—*i.e.*, as part of the process of determining whether the mobile station is on a "home" network, both for purposes of determining which network to select and for determining which network name to display based on the selected network. For example, the HPLMN Selector could take the place of Cousin SID List 200 in Step B of Figure 4B. *Id.*

410. McElwain discloses that multiple networks, each with a distinct identifier ("SID"), may exist in a single geographical area. *Id.* ¶ 47. For example, the plurality of SIDs "could all be associated with the same service provider," or "two of the SIDs could be associated with one service provider and another one or others associated with other service provider(s)." *Id.* The process of selecting,

registering, and displaying a network name in McElwain helps determine "whether the mobile station is operating in its home network, or whether it is operating in a roaming condition," where roaming charges may be incurred. *Id.* ¶¶ 16, 25, 45. In my opinion, a POSITA would have been motivated to modify the network selection and registration process in the 3GPP Standards to use the HPLMN Selector as a list of equivalent home networks for these same purposes—*i.e.*, helping determine whether the mobile station was in a home network or operating in a roaming condition. Additionally, a POSITA would have been motivated to use the HPLMN list from McElwain (the Cousin SID list) as the list of PLMN networks for which the same home network name will be displayed. This would serve the goal identified in the 3GPP Standards of associating the same home network name with multiple PLMNs. *See, e.g.*, TS-22.101 (Ex. 1008) at 28.

411. McElwain also discloses using 3GPP networks, including GSM networks. For example, after identifying several different standards, McElwain states: "In the presently preferred, but not limiting, embodiment, the protocol could conform to one of the above-mentioned ANSI-136, AMPS, CDMA or various ones of the GSM protocols, and/or to various modifications and enhancements thereto." McElwain (Ex. 1004) ¶ 36. As I explained above, the modification and enhancements to GSM were transferred to 3GPP, which is indeed continuing the modifications and enhancements of GSM to this day. *See* Section VI.A.5, VI.A.7.

412. The proposed combination of the 3GPP Standards and McElwain would have been nothing more than the combination of prior art elements (the HPLMN Selector in the 3GPP Standards and the HPLMN list, Cousin SID list, from McElwain) according to known methods (using the HPLMN Selector as an HPLMN list, similar to how McElwain uses the Cousin SID list during selection and registration) to yield predictable results (allowing multiple networks to be declared a "home" network, and listing those networks in a single list, as is with McElwain's Cousin SID list).

413. In my opinion, a POSITA would have had a reasonable expectation of success in implementing this combination. It is a predictable, straightforward method of allowing multiple networks to be declared "home" networks, as opposed to roaming networks that incur additional charges. HPLMN lists were known at the time of the '933 patent, and using the HPLMN Selector (an already-existing list) as an HPLMN list during selection and registration would have been a predictable, straightforward application of known techniques.

3. Specific Grounds of Invalidity

a. Ground 5: Claims 1-4, 6-9, 11-14 & 19 Would Have Been Obvious Over the 3GPP Standards and McElwain

(i) Elements 1[pre], 6[pre], 11[pre] & 19[pre]

1[pre]: "A network name displaying method in a mobile station, the method comprising"

6[pre]: "A mobile station, comprising"

11[pre]: "A computer program product"

19[pre]: "A network name displaying method in a mobile station, the method comprising"

414. It is my opinion that the 3GPP standards in combination with McElwain render obvious these limitations.

415. I understand that claim preambles are usually not limiting. To the extent the preambles are limiting, the 3GPP Standards disclose methods of operating a mobile station to display a network name. For example, TS-23.122 "specifies functions related to Mobile Station (MS) in idle mode." TS-23.122 (Ex. 1007) at 4-5. TS-22.101 further describes displaying "Country/PLMN indication" and "Service Provider Name indication." TS-22.101 (Ex. 1008) at 28.

416. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses these limitations as well for the reasons stated in Section IX.A.3.a(i), and it would have been obvious to a POSITA to combine McElwain and the 3GPP Standards. *See* Section IX.B.2.b.

417. McElwain discloses mobile station 10, which "may provide a visual or other display to the user to inform the user of the current service provider status." McElwain (Ex. 1004) ¶¶ 33, 37, 54, Figs. 1-2. Furthermore, McElwain's mobile station includes a memory (*e.g.*, memories 12 and 12A) storing "instructions that controls the operation of processor 170." *Id.* ¶ 33. In my opinion, a POSITA would

have understood these instructions to comprise a computer program as required by claim 11.

(ii) Elements 1[a], 6[a], 11[d] & 19[a]

1[a]: "scanning to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area"

6[a]: "a transceiver being operative to scan to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area"

11[d]: "causing a scanning process to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area"

19[a]: "scanning to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within coverage area"

418. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

419. The 3GPP Standards disclose scanning and receiving a plurality of MCC/MNC codes corresponding to a plurality of wireless communication networks in a coverage area. The 3GPP Standards explain that "[w]hen an MS is switched on, it attempts to make contact with a public land mobile network (PLMN)." TS-23.122 (Ex. 1007) at 8. As I've explained above, the mobile station does so by receiving a plurality of PLMN codes (MCC/MNC codes) over the air. In my opinion, a POSITA

would thus have understood that, in the 3GPP Standards, the mobile station scans and receives a plurality of MCC/MNC codes corresponding to a plurality of wireless communication networks in a coverage area. *See* Section IX.B.1.

420. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses these limitations as well for the reasons stated in Section IX.A.3.a(ii), and it would have been obvious to a POSITA to combine them because, among the other reasons I discuss above, both references are directed to scanning for a plurality of MCC/MNC pairs. *See* Section IX.B.2.b.

(iii) Element 6[b]

6[b]: "a Subscriber Identity Module (SIM) interface for receiving a SIM"

421. It is my opinion that the 3GPP Standards in combination with McElwain render obvious this limitation.

422. The 3GPP Standards disclose that the mobile station contains a SIM. For example, TS-23.122 defines "SIM" as "Subscriber Identity Module" and references another 3GPP specification (TS 21.111) that describes the requirements of the SIM. TS 23.211 at 8. TS-23.122 also refers to inserting and removing the SIM, which in my opinion, a POSITA would have understood confirms that the mobile station has an interface for receiving a SIM. *Id.* at 9.

423. To the extent the 3GPP Standards do not disclose or render obvious this element, McElwain discloses it as well for the reasons stated in Section IX.A.3.a(iii), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

424. McElwain also discloses that its mobile station comprises "non-volatile memory 12A which may be embedded or which may be removable, such as a removable Subscriber Identification Module (SIM)." McElwain (Ex. 1004) ¶ 33. In my opinion, a POSITA would have understood that a mobile device with a removable SIM includes an interface for receiving the SIM.

(iv) Elements 11[a] & 11[b]

11[a]: "a computer storage medium"

11[b]: "computer instructions stored on the computer storage medium"

425. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

426. In my opinion, a POSITA would have understood that the mobile station described in the 3GPP Standards necessarily includes a computer storage medium with computer instructions. *See* Section VI.B.

427. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses these limitations as well for the reasons stated in Section IX.A.3.a(iv), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

428. McElwain expressly discloses a mobile station with a computer storage medium (*e.g.*, memories 12 and 12A) storing "instructions that controls the operation of processor 170." McElwain (Ex. 1004) ¶ 33. As I've explained above, a POSITA would have understood these instructions to comprise computer instructions as required by claim 11.

(v) Elements 6[c] & 11[c]

6[c]: "a processor being operative to"

11[c]: "the computer instructions being executable by a processor for executing the steps of"

429. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

430. In my opinion, a POSITA would have understood that the mobile station described in the 3GPP Standards necessarily includes a processor, including computer instructions to be executed on the processor. *See* Section VI.B.

431. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses these limitations as well for the reasons stated in Section IX.A.3.a(v), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

432. McElwain discloses that the mobile station includes a processor 170. McElwain (Ex. 1004) ¶ 33, Fig. 2. Memories 12 and 12A in McElwain's mobile station store "instructions that controls the operation of processor 170." *Id.* ¶¶ 33

("Processor 170 generates appropriate commands and controls the other component blocks of mobile station 10."), 37. As I've explained above, the processor executes these instructions to accomplish the steps of claims 6 and 11.

(vi) Elements 1[b], 6[d], 11[e] & 19[b]

1[b]: "selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list"

6[d]: "select and register with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of Preferred PLMN (PPLMN) list"

11[e]: "selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PLMN) list"

19[b]: "selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list"

433. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

434. The 3GPP Standards describe selecting and registering with a wireless network associated with one of the received MCC/MNC pairs. TS-23.122 describes the processes of "PLMN selection" and "registration." TS-23.122 (Ex. 1007) at 8-9.

For example, Section 4.4 of TS-23.122 is the "PLMN selection process," which is followed by "registration on the selected PLMN." *Id.* at 13; *see generally id.* at 13-18.

435. As part of selecting and registering on a PLMN, the 3GPP Standards teach giving preference to home networks of an HPLMN list over non-home networks of a PPLMN list. As explained above (*see* Section IX.B.1), the HPLMN Selector is an HPLMN list and includes "multiple PLMN codes." TS-23.122 (Ex. 1007) at 13; TS-31.102 (Ex. 1009) at 54. This is shown in the data field below from TS-31.102. *Id.*

Identifier: '6F62'	Structure: Transparent	Optional
SFI: '13'		
File size: 5n (n ≥ 1) bytes	Update activity: low	
Access Conditions: READ PIN UPDATE ADM DEACTIVATE ADM ACTIVATE ADM		

Bytes	Description	M/O	Length
1 to 3	1^{st} PLMN (highest priority)	M	3 bytes
4 to 5	1^{st} PLMN Access Technology Identifier	M	2 bytes
6 to 8	2^{nd} PLMN	O	3 bytes
9 to 10	2^{nd} PLMN Access Technology Identifier	O	2 bytes
:	:		
(5n-4) to (5n-2)	n^{th} PLMN (lowest priority)	O	3 bytes
(5n-1) to 5n	n^{th} PLMN Access Technology Identifier	O	2 bytes

436. Both the User PLMN Selector and Operator PLMN Selector are PPLMN lists. Each "contains the coding for n PLMNs," which "define[] the preferred PLMNs . . . in priority order." TS-31.102 (Ex. 1009) at 17; *id.* at 52. TS-23.122 describes these as "list[s] of 'equivalent PLMNs.'" TS-23.122 (Ex. 1007) at 13.

437. Annex A to TS-23.122 provides the matching criteria for comparing MCC/MNC pairs, which includes comparing all three digits of each of the MCC and MNC codes. TS-23.122 (Ex. 1007) at 27.

438. When selecting and registering with a PLMN, the 3GPP Standards teach giving preference to a home network of the HPLMN Selector over the PPLMN lists. *See* TS-23.122 (Ex. 1007) at 13-14. For example, the network selection procedure described in TS-23.122 prefers an HPLMN over any of the PLMNs in the User and Operator PLMN Selectors. *Id.* at 14. Although the selection procedure described in Section 4.4.3.1.1 attempts registration on a single HPLMN (not an HPLMN list), a POSITA would have understood the 3GPP Standards to teach that the HPLMN Selector provisions "multiple HPLMN codes," and thus could and would be used as an HPLMN list in the selection and registration procedure. *Id.* at 13.

439. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain teaches these limitations as well for the reasons stated in Section IX.A.3.a(vi), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b. For example, McElwain discloses a Cousin SID list representing a plurality of networks belonging to one service provider, each of which is considered a "home" network. As explained in McElwain, "[i]f the received SID matches any one of the stored SIDs in the Cousin SID list 200, the mobile station 10

. . . makes the determination that the category of the associated service provider is a Home service provider, and that the mobile station 10 is not roaming." McElwain (Ex. 1004) ¶ 46. If there is not a match with an MCC/MNC pair in the HPLMN list (*i.e.*, Cousin SID list), the mobile station then checks the conventional intelligent roaming database (IRDB) table 210 for, *e.g.*, a "Partner" SID or "Favored" SID. *Id.* ¶¶ 49-50, Fig. 4B. In my opinion, a POSITA would have understood that the IRDB acts as a Preferred PLMN (PPLMN) list.

440. As explained above, in my opinion, it would have been obvious to a POSITA to combine the 3GPP Standards and McElwain, including by implementing the HPLMN Selector similarly to how McElwain implements the Cousin SID list. *See* Section IX.B.2.b.

(vii) Elements 1[c], 6[e] & 11[f]

1[c]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks of the HPLMN list"

6[e]: "compare the MCC and MNC pair of the selected network with a plurality of home network NICC[22] and MNC pairs corresponding to the home networks of the HPLMN list and associated with a home network display name"

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[22] As I indicated earlier, I am interpreting NICC as a typographical error for MCC instead.

11[f]: "comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks in the HPLMN and associated with a home network display name"

441. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

442. The 3GPP Standards teach comparing the MCC/MNC pair of the selected network with a plurality of home network MCC/MNC pairs corresponding to home networks of the HPLMN list and associated with a home network display name.

443. For example, Annex A.4 to TS-22.101 provides that a "service provider name is stored in the USIM in text and/or optionally graphic format," and that "[i]t shall be possible to associate at least 10 PLMN Identifications . . . with the same SP Name." TS-22.101 (Ex. 1008) at 28. When registered on any of the these 10 PLMN identifications, "[t]he SP Name shall be displayed." *Id.* To determine which name to display, the mobile station would compare the MCC/MNC pair of the selected network with up to ten PLMN identifications associated with the same network display name. In my opinion, a POSITA would have understood that one beneficial implementation of Annex A.4 is to associate the PLMN identifications from the HPLMN Selector with the same home network display name. In my opinion, it also would have been obvious to a POSITA to associate the PLMN identifications from the HPLMN Selector with the same home network display name. The 3GPP

Standards teach that the HPLMN Selector provides for "multiple HPLMN codes." TS-23.122 (Ex. 1007) at 13. It would have been obvious to associate each of these HPLMN codes with the same home network name so the subscriber knows that he or she is not roaming.

444. As explained above, the data structures in Sections 4.2.58 and 4.2.59 in TS-31.102 can also be used to display the same home network name for multiple PLMNs. The Operator PLMN List in Section 4.2.59 contains a list of Location Area Identities (LAIs) (each of which includes an MCC/MNC pair) with pointers to specific network names in the PLMN Network Name list in Section 4.2.58. TS-31.102 (Ex. 1009) at 58-59. As explained above (*see* Section IX.B.1), multiple MCC/MNC pairs in the Operator PLMN List can point to a single "home" network name in the PLMN Network Name list.

445. In my opinion, a POSITA could and would also have used the PLMN Network Name and Operator PLMN List to display the same home network name for multiple PLMNs, which would include a comparison of the MCC/MNC pair of the selected network with MCC/MNC pairs in the Operator PLMN List. A POSITA would have been motivated to include all of the MCC/MNC pairs from the HPLMN Selector in the Operator PLMN List, each pointing to the same "home" display name in the PLMN Network Name list. It would have been obvious to a POSITA to

associate the PLMN identifications from the HPLMN Selector with the same home network display name so the subscriber knows that he or she is not roaming.

446. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain teaches these limitations as well for the reasons stated in Section IX.A.3.a(vii), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b. In my opinion, for instance, it would have been obvious to a POSITA to combine those teachings with the 3GPP Standards, because a POSITA would have been motivated to use the HPLMN Selector in the 3GPP Standards in the same way McElwain uses the Cousin SID list. Additionally, it would have been obvious to a POSITA to use the HPLMN list from McElwain as the list of PLMN networks for which the same home network name will be displayed (as taught in the 3GPP Standards). This would serve the goal identified in the 3GPP Standards of associating the same home network name with multiple PLMNs. TS-22.101 (Ex. 1008) at 28.

(viii) Elements 1[d], 6[f] & 11[g]

1[d]: "for the step of comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) in the comparing step based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station in the comparing step"

6[f]: "for the comparison: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on the SIM for the comparison based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station for the comparison"

11[g]: "for the comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) for the comparing based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station for the comparing"

447. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

448. The 3GPP Standards teach that the lists of MCC/MNC pairs corresponding to specific display names are "store[d] on the USIM." TS-22.101 (Ex. 1008) at 28. The 3GPP Standards also teach storing information in the memory of the mobile station. *E.g.*, TS-23.122 (Ex. 1007) at 9 ("Optionally the ME may store in its memory an extension of the 'forbidden PLMNs' list. The contents of the extension of the list shall be deleted when the MS is switched off or the SIM is removed."). In light of this, it would have been obvious to a POSITA to store any data structures, such as the HPLMN Selector, in internal memory as well as the SIM. Thus, in my opinion, a POSITA would understand that the home network

MCC/MNC codes could be stored on either the SIM or in internal memory of the mobile station.

449. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain teaches these limitations as well for the reasons stated in Section IX.A.3.a(viii), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

450. McElwain also discloses these limitations. For example, McElwain discloses that the Cousin SID list can be stored in either a SIM or in the memory of the mobile station. Specifically, McElwain discloses: "[A] retailer that sells the prepaid service provider's mobile stations 10 may program the Cousin SID list 200 . . . directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the customer along with the mobile station 10." McElwain (Ex. 1004) ¶ 39. Elsewhere in the disclosure, McElwain clarifies that one example of a "removable card" is a SIM card. For example, McElwain states that "[a] separate removable SIM 15 can be provided as well, the SIM storing, for example, subscriber-related information." *Id.* ¶ 38.

451. It was well known at the time of the '933 patent that SIM cards were one of the most common locations to store subscriber information, including lists of networks for subscribers. A POSITA would have understood that there were a finite number of places to store such lists of networks, including principally the SIM card,

the internal memory of the mobile station, or some other removable media. TS 22.101 teaches, for example, that lists of PLMNs can be stored either in the mobile device or in the SIM, with storage on the SIM taking priority over storage on the mobile device. TS-22.101 (Ex. 1008) at 28; *see also* TS-31.102 (Ex. 1009) at 58-59. A device would have to start looking in one of these places for an HPLMN list and thus starting in any of these places would have been obvious to a POSITA. As explained above (*see* Section VI.B.1), a SIM card often contains data related to a particular subscriber and the allowable networks and services for that subsciber. Thus, a POSITA would have been motivated to program the device to check the SIM card first, which is the most likely location for the "home" networks for that subscriber.

452. In my opinion, it would have been obvious to program the mobile station to *first* checking the SIM card for the HPLMN list and *then*, if not on the SIM card, checking the mobile station's memory for the HPLMN list in that order. Indeed, SIM cards were the most common location to store subscriber information, including lists of networks for subscribers. Furthermore, in order to locate a list of MCC/MNC pairs, a mobile station must start looking somewhere, and there are essentially two options—starting with the SIM card or starting with the internal memory of the phone. It would have been obvious to program the mobile station to check the SIM card first for such a list, followed by the internal memory of the phone

or other removable storage. Applying such known techniques would have yielded predictable results, with a reasonable expectation of success.

(ix) Elements 1[e], 6[g], 11[h] & 19[c]

1[e]: "causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"

6[g]: "cause the home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs"

11[h]: "causing the home network display name which is the same for all home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC am MNC pair of the selected network and one of the home network MCC and MNC pairs"

19[c]: "causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually display in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network, and one of the home network MCC and MNC pairs"

453. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

454. The 3GPP Standards disclose causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match

between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs. *E.g.*, TS-22.101 (Ex. 1008) at 28; TS-31.102 (Ex. 1009) at 58-59, 63-64.

455. As explained above, once the mobile station selects and registers with a PLMN, "the MS indicates [*i.e.*, displays] the selected PLMN." TS-23.122 (Ex. 1007) at 15. TS-22.101 describes procedures for determining which PLMN identification to display. *See* TS-22.101 (Ex. 1008) at 28.

456. For example, Annex A.3 explains that "[i]t shall be possible to store on the USIM at least 10 PLMN Identifications . . . for which the same PLMN name shall be displayed." *Id.* Annex A.4 additionally provides that a "service provider name is stored in the USIM in text and/or optionally graphic format." *Id.* As with the PLMN name, "[i]t shall be possible to associate at least 10 PLMN Identifications . . . with the same SP Name." *Id.* When registered on any of the these 10 PLMN identifications, "[t]he SP Name shall be displayed." *Id.* The PLMN Name (which is the same for at least 10 PLMN identifications) can also be optionally displayed. *Id.*

457. As an example of how this is done, Section 4.2.66 of TS-31.102 shows the "Service Provider Display Information," which "contains a list of n PLMNs in which the Service Provider Name shall be displayed." TS-31.102 (Ex. 1009) at 63-64.

<table>
<tr><td colspan="2">Identifier: '6FCD'</td><td>Structure: transparent</td><td>Optional</td></tr>
<tr><td colspan="2">SFI: '1B'</td><td colspan="2"></td></tr>
<tr><td colspan="2">File size: x bytes</td><td colspan="2">Update activity: low</td></tr>
<tr><td colspan="4">Access Conditions:
READ PIN
UPDATE ADM
DEACTIVATE ADM
ACTIVATE ADM</td></tr>
<tr><td>Bytes</td><td>Description</td><td>M/O</td><td>Length</td></tr>
<tr><td>1 to x</td><td>TLV object(s) containing Service Provider information</td><td>M</td><td>x bytes</td></tr>
</table>

458. As another example, the data structures in Sections 4.2.58 and 4.2.59 in TS-31.102 can be used to display the same home network name for multiple PLMNs. The Operator PLMN List in Section 4.2.59 contains a list of Location Area Identities (LAIs) (each of which includes an MCC/MNC pair) with pointers to specific network names in the PLMN Network Name list in Section 4.2.58. TS-31.102 (Ex. 1009) at 58-59. As explained above (*see* Section IX.B.1), multiple "home" MCC/MNC pairs in the Operator PLMN List can point to the same "home" network name in the PLMN Network Name list to be displayed.

459. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain teaches these limitations as well for the reasons stated in Section IX.A.3.a(ix). In my opinion, it would have been obvious to a POSITA to combine those teachings with the 3GPP Standards for the reasons described in Section IX.B.2.b.

(x) **Elements 1[f], 6[h], 11[i] & 19[d]**

1[f]: **"otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

6[h]: **"otherwise cause an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

11[i]: **"otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

19[d]: **"otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs"**

460. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these limitations.

461. The 3GPP Standards disclose, if the home network name is not displayed (*i.e.*, if there is no match between the MCC/MNC pair of the selected network and the home network MCC/MNC pairs), causing an alternate display name to be visually displayed in the visual display. For example, Annex A.4 to TS-22.101 discloses that if the MS is *not* registered on an HPLMN, "[t]he PLMN name shall be displayed." TS-22.101 (Ex. 1008) at 28. The PLMN name is an alternate display name to the SP Name displayed for any of the home networks. Thus, if there is not a match between the MCC/MNC pair of the selected network and any of the

MCC/MNC pairs associated with the SP Name (*i.e.*, the home network MCC/MNC pairs), an alternate display name is visually displayed.

462. Similarly, with respect to the Operator PLMN List and PLMN Network Name list (*see* Section IX.B.1), the PLMN Network Name list can contain both a "home" network name and other names. The networks in the Operator PLMN List each point to one of the network names in the PLMN Network Name list. If the selected MCC/MNC pair does *not* correspond to one of the MCC/MNC pairs in the Operator PLMN List pointing to the "home" network in the PLMN Network Name list, then it will point to one of the alternate names in that list. Thus, an alternate name will be visually displayed. *See* TS-31.102 (Ex. 1009) at 58-59. These two files allow for all of the networks in the HPLMN list (HPLMN Selector) to point to the same network name and those in the PPLMN lists (*e.g.*, User and Operator PLMN Selectors) to point to alternative names. *Id.*

463. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain teaches these limitations as well for the reasons stated in Section IX.A.3.a(x). In my opinion, it would have been obvious to a POSITA to combine those teachings with the 3GPP Standards for the reasons described in Section IX.B.2.b.

(xi) Claims 2, 7 & 12

2: **"The method of claim 1, wherein the plurality of home network MCC and MNC pairs are stored in the SIM."**

7: **"The mobile station of claim 6, wherein the plurality of home network MCC and MNC pairs are stored on the SIM."**

12: **"The computer program product of claim 11, wherein the plurality of home network MCC and MNC pairs are stored in the SIM."**

464. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these claims.

465. The 3GPP Standards teach that the lists of MCC/MNC pairs corresponding to specific display names are "store[d] on the USIM." TS-22.101 (Ex. 1008) at 28; TS-31.102 (Ex. 1009) at 58-59, 63-64.

466. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses these claims as well for the reasons stated in Section IX.A.3.a(xi), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

467. McElwain also discloses these limitations. For example, McElwain discloses that the Cousin SID list can be stored in the SIM. Specifically, McElwain discloses: "[A] retailer that sells the prepaid service provider's mobile stations 10 may program the Cousin SID list 200 . . . directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the customer along with the mobile station 10." McElwain (Ex. 1004) ¶ 39.

Elsewhere in the disclosure, McElwain clarifies that one example of a "removable card" is a SIM card. For example, McElwain states that "[a] separate removable SIM 15 can be provided as well, the SIM storing, for example, subscriber-related information." *Id.* ¶ 38.

(xii) Claims 3 & 13

3: "The method of claim 1, wherein the plurality of home network MCC and MNC pairs are stored in the memory of the mobile station."

13: "The computer program product of claim 11, wherein the plurality of home network MCC and MNC pairs are stored in the memory of the mobile station."

468. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these claims.

469. The 3GPP Standards teach storing in the memory of the mobile station. *E.g.*, TS-23.122 (Ex. 1007) at 9 ("Optionally the ME may store in its memory an extension of the 'forbidden PLMNs' list. The contents of the extension of the list shall be deleted when the MS is switched off or the SIM is removed."). Thus, in my opinion, a POSITA would have understood that the home network MCC/MNC codes could be stored in internal memory of the mobile station.

470. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses these claims as well for the reasons stated in Section IX.A.3.a(xii), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

471. McElwain also discloses these limitations. For example, McElwain discloses that the Cousin SID list can be stored in either a SIM or in the memory of the mobile station. Specifically, McElwain discloses: "[A] retailer that sells the prepaid service provider's mobile stations 10 may program the Cousin SID list 200 . . . directly into the memory of the mobile station 10, or it may be programmed into a removable card or module that is given to the customer along with the mobile station 10." McElwain (Ex. 1004) ¶ 39.

(xiii) Claims 4, 9 & 14

4: **"The method of claim 1, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying."**

9: **"The mobile station of claim 6, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying."**

14: **"The computer program product of claim 11, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying."**

472. It is my opinion that the 3GPP Standards in combination with McElwain render obvious these claims.

473. In my opinion, a POSITA would have understood that the 3GPP Standards teach the idea that a Location Area Code (LAC) may be used in the acts of comparing and identifying. For example, the 3GPP Standards teach that "Location Area Information" (LAI) includes "the MCC, MNC and LAC." TS-31.102 (Ex. 1009) at 59. In my opinion, a POSITA would have been motivated

to use the complete LAI instead of just MCC/MNC pairs. The use of the LAC provides additional granularity in identifying different portions of different networks. *See* Section IX.A.3.c(i). For example, Hicks explains that the MCC/MNC pair for Raleigh, North Carolina, is 310-150, but that this same PLMN "includes a large geographical area, including Charlotte and Atlanta, among other locations in the southeastern USA." *Id.* at 1:13-17. Using LACs, a provider could designate only portions of that large geographical area to be the "home" network for certain subscribers, using different display names for the other cities in that same large geographical area.

(xiv) Claim 8

8: "The mobile station of claim 6, wherein the memory is separate and apart from the SIM in the mobile station."

474. It is my opinion that the 3GPP Standards in combination with McElwain render obvious this claim.

475. In my opinion, a POSITA would understand that the mobile station of the 3GPP Standards would have memory separate and apart from the SIM. For example, TS-31.102 (which relates to the contends of the SIM) states that the PLMN Network Name list is to be used "in place of its own versions of the network name for the PLMN (stored in the ME's memory list)." TS-31.102 (Ex. 1009) at 58. In other words, the mobile device (ME) has its own memory separate and apart from the SIM, which may contain additional files and lists.

476. To the extent the 3GPP Standards do not disclose or render obvious these elements, McElwain discloses this claim as well for the reasons stated in Section IX.A.3.a(xiii), and it would have been obvious to a POSITA to combine them. *See* Section IX.B.2.b.

477. McElwain discloses this claim. In McElwain, there is memory separate and apart from the SIM in the mobile station. For example, McElwain discloses memory 12, such as read-only memory 12A and random access memory 12B. *See* McElwain (Ex. 1004) ¶¶ 37-38. It then states that "[a] separate removable SIM 15 can be provided as well." *Id.* ¶ 38. Thus, I believe a POSITA would have understood that the memory in McElwain's mobile station is separate and apart from the SIM.

X. ADDITIONAL REMARKS

478. I currently hold the opinions expressed in this Declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

479. I hereby declare that all statements made are of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Executed this 24th day of June, 2020, in Vienna, VA.

Dr. Apostolos K. Kakaes

APPENDIX A

APOSTOLOS K. KAKAES

Cosmos Communications Consulting Corporation, President

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AREAS OF EXPERTISE

All aspects of fixed and mobile communications. Over the years, my emphasis has been both in breadth and in depth, originally in fixed communications networks and then in mobile communications. Specific areas of in-depth expertise include:

- LTE/LTE-Advanced and evolution issues of 3G to 4G and 5G
- UMTS, including FDD, TDD, HSDPA/HSUPA, HSPA+, both air interface (UTRA) and Radio Access Network (RAN) as well as Core Network (CN) technologies
- GSM, GPRS, EDGE (EGPRS) and related evolutionary problems and solutions
- cdma2000 family from IS-95, through its evolution to 1x, 3x, 1xEV-DO (HDR), 1xED-DV (all aspects of the evolution to "3G" and beyond)
- Wired and Wireless Local Area Networks (LAN) including all variants of IEEE 802.11 (WiFi)
- Metropolitan Area Networks (MAN), and Personal Area Networks (PAN) technologies, Paging networks, Ad hoc networks, including IEEE 802.16 (WiMAX), HIPERLAN, Bluetooth, Near Field Communications, IrDA (Infrared Data Association) operating with any of the available access technologies
- North American TDMA and IS-54/IS-136
- IMS, SIP, and VoIP (Voice over IP), including VoIP over LTE
- TETRA
- iDEN™
- Core Network technologies, IS-41, SS7, ATM, MAP, SAE, etc.
- Design and implementation of voice and data networking (circuit switching as well as all the evolving all IP-based technologies)
- Traffic engineering and network design; both air interface aspects (including resource allocation, QoS, MAC protocol, etc.) and design of core network, both user plane and control plane

EMPLOYMENT HISTORY

9/88 – Present
Cosmos Communications Consulting Corporation. Founder and president of private communications engineering consulting firm specializing in mobile communications. Initially part time; full time since 1994.

- Developed and presented courses, seminars, and lectures on fixed and mobile communications to both corporate and government entities, such as the FCC and the US Marshal's Office.
- Consulted on high level technology-related issues and trends, pros and cons of each, etc. to corporate entities, governmental agencies, and international organizations, such as the UN.

- Consulted at the detailed technical level to engineering firms, operators, and equipment vendors on technical issues related to existing or evolving technologies for mobile communications.
- Served as technology consultant to the investment community on issues related to both fixed and wireless communications technologies.
- Served as consultant and/or testifying expert witness on both civil and criminal legal cases, including a class action lawsuit brought in California, a murder case in Illinois, and several patent infringement cases both at the ITC and in district courts.
- Served as consultant and/or testifying expert witness on several Inter-Parte Re-examinations (IPRs).
- Served as consultant and/or testifying expert witness in multiple legal proceedings involving the determination of "FRAND" rates for global licenses involving "SEP" patents.
- Participated as a technical consultant in the analysis of large patent portfolios for the purposes of due diligence, sales, and/or M/A activities for some of the largest companies in the mobile communications space.

These projects spanned a multidimensional spectrum of
- Technologies: both fixed and mobile communications as they have evolved over the past 30+ years;
- Audiences: non-technical support personnel, highly specialized engineers, Wall Street analysts, hedge fund managers, litigation teams, as well as decision making executives at the CEO/CFO/CTO level;
- Geographic and cultural backgrounds that span all continents and over 40 countries.

9/87 - 5/94
The George Washington University, Washington, D.C.; Department of Electrical Engineering and Computer Science.
- Taught mostly graduate courses in the area of communication engineering, including communication theory, coding theory, voice and data networking, and mobile communications.
- Proposed, developed and taught new graduate courses in the area of mobile communications.
- Received several research awards/grants, including the prestigious NSF Research Initiation Award.
- Participated in several committees, including the departmental Graduate Curriculum Committee as well as various University-wide committees.

7/85 - 12/86
Polytechnic Institute of New York, Brooklyn, New York. Joint appointment as Special Research Fellow and Adjunct Instructor (while pursuing the Ph.D. degree)

1/82 - 7/87
AT&T Bell Laboratories, Holmdel, New Jersey. Worked on modeling, analysis, design, and performance evaluation of voice and data networks. Developed algorithms for DNHR (Dynamic, Non-Hierarchical Routing) used in the telephone network. Analysis of advanced data services and formulation of long term plans for development of

enhanced data services and network design tools to support such services.

7/76 - 12/81
University of Colorado, Boulder, Colorado and Michigan State University, East Lansing, Michigan. Undergraduate and then graduate teaching assistant.

EDUCATION

09/82 - 01/88
Polytechnic Institute of New York. Ph.D. in Electrical Engineering with a minor in Applied Mathematics.
Thesis Title: Topological Properties and Design of Multihop Packet Radio Networks.
Thesis Advisor: Professor Robert R. Boorstyn.

09/74 - 06/80
University of Colorado.
M.S. in Applied Mathematics with a minor in Electrical Engineering.
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PROFESSIONAL ASSOCIATIONS AND ACTIVITIES

- Member of the IEEE (Active in the Communications Society, Vehicular Technology Society, and the Information Theory Society).
- Secretary, IEEE Communications Society National Capital Area Chapter, 91/92.
- Vice-Chair, IEEE Communications Society National Capital Area Chapter, 92/93.
- Vice-Chair of the Communication Theory Technical Committee of the Communications Society of the IEEE; Elected for the 1993-1996 term.
- Treasurer of the Communication Theory Technical Committee of the Communications Society of the IEEE, Elected for the 1996-1999 term.
- Reviewer for the IEEE, book editors, and other technical publications.
- Reviewer for various NSF Panels.
- Active Participant and Organizer of Technical Sessions in Technical Conferences, including the IEEE International Conference on Communications (ICC) and IEEE Global Communications Conference (Globecom).
- Technical Program Chair for the Communication Theory Mini-Conference, Dec. 1992.

PUBLICATIONS AND PRESENTATIONS

1. "Topological Properties and Design of Multi-Hop Packet Radio Networks"; Presented at the IEEE Information Theory Society Meeting; Arlington, Virginia; February 1988.
2. "Topology and Capacity of Multi-Hop Packet Radio Networks" (Joint with R.R. Boorstyn); 1988 International Symposium on Information Theory; Kobe, Japan; June 1988.
3. "Placing Repeaters in Multi-Hop Packet Radio Networks" (Joint with R.R.

Boorstyn); *Proceeding of Globecom '89*, Dallas, Texas; November 1989.

4. "Topological Properties and Design of Packet Radio Networks"; Invited Presentation at the National Technical University of Athens; Athens, Greece; January 10, 1990.
5. "Channel Allocation Strategies in Dual Mode Digital Cellular Networks"; *Proceedings of Globecom '90*, San Diego, California; December 1990.
6. "Bandwidth Allocation Techniques in Dual Mode Cellular Systems"; Invited Presentation at the Rutgers University Wireless Information Networks Laboratory (WINLAB); January 25, 1991.
7. "Some Topological Properties of Different Classes of Random Graphs with Applications to Communication Networks", *Proceedings of the IEEE Information Theory Symposium*, Budapest, Hungary; June 1991.
8. "The Effects of Residual Bandwidth in TDMA Cellular Networks", IEEE Communication Theory Workshop, Rhodes, Greece, July 1991.
9. "Concentrators and Concentrator Design", *Encyclopedia of Telecommunications*, Fritz E. Froehlich, Editor-in-chief; Marcel Dekker, Inc, 1992.
10. "Comparison of TDMA and CDMA for Cellular Networks," Ecole Nationale Superieure des Telecommunications, Paris, France, March 5, 1992.
11. "Dual Mode Digital Cellular Networks: The Effects of Bandwidth Segmentation on Digital and Analog Users," Presented at the IEEE Communications Society Meeting, April 16, 1992.
12. "Dynamic Channel Allocation and Reallocation for Dual-System Cellular Networks, *Workshop Record*, (with Sirin Tekinay and Bijan Jabbari), Third Winlab Workshop on Third Generation Wireless Information Networks, Piscataway, NJ, April 28-29, 1992.
13. "Spread Spectrum Technology Applications in Telecommunications," Tutorial presented at the 1992 IEEE Mohawk Valley Section Conference, June 1992.
14. "Spread Spectrum Fundamentals: Techniques and Applications", Tutorial (in cooperation with Giovanni Vannucci) presented at ICC'92, June 1992.
15. "Global System for Mobile Communications (GSM)", Presented at ICC'93, Geneva, Switzerland, May 25, 1993.
16. "Data Communications Basics", *Encyclopedia of Software Engineering*", John Wiley & Sons, Inc., 1993.
17. "Modelling of Cellular Communication Networks with Heterogeneous Traffic Sources" (with Sirin Tekinay and Bijan Jabbari), *Proceedings of the International Conference on Universal Personal Communications, 1993*, October 1993.
18. "Global System for Mobile Communications (GSM)", Presented at the Francusko-Polska Wysza Szkowa, Poznan, Poland, March 1994.
19. "Traffic Engineering for Cellular Network Design", Presented at the Francusko-Polska Wysza Szkowa, Poznan, Poland, March 1994.
20. "Principles of Traffic Engineering and Network Design", Presented at the Regional Seminar on Mobile Cellular Radio Telephone Systems, by invitation of the ITU, April 19, 1994.
21. "Principles of Spread Spectrum Systems for Mobile Communications", Presented at the Regional Seminar on Mobile Cellular Radio Telephone Systems, by invitation of the ITU, April 20, 1994.
22. "Global System for Mobile Communications (GSM)", Presented at the Regional Seminar on Mobile Cellular Radio Telephone Systems, by invitation of the ITU, April 21, 1994.
23. "Global System for Mobile Communications (GSM)", Presented at ICC'94, New

Orleans, LA.; May 1, 1994.

24. "GSM and DCS1900: Evolution to PCS", ICC/Supercom 1996, Dallas, Texas; June 23-27, 1996.
25. "Traffic Engineering Models for Mobile Communications", ICUPC96, Cambridge, Massachusetts; Sept. 29 - October 2, 1996.
26. "GSM-Recent Advances and Future Developments", Globecom'96, London, UK; November 1996.
27. "Advances in GSM and DCS1800/1900", ICC '97, Montreal, Canada; June 1997.
28. "The Global System for Mobile Communications (GSM) and its Derivatives (DCS1800, PCS1900)", ICC/Supercom '98, Atlanta, GA; June 1998.
29. "Teletraffic Engineering", Globecom '98, Sydney, Australia; November 1998.
30. "Traffic Engineering" in Encyclopedia of Telecommunications, Edited by John Proakis, John Wiley, 2002.

APPENDIX B

CHALLENGED CLAIM LISTING

No.	Limitation
1[pre]	A network name displaying method in a mobile station, the method comprising:
1[a]	scanning to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area;
1[b]	selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list;
1[c]	comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks of the HPLMN list;
1[d]	for the step of comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) in the comparing step based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station in the comparing step;
1[e]	causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs; and
1[f]	otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs.
2	The method of claim 1, wherein the plurality of home network MCC and MNC pairs are stored in the SIM.
3	The method of claim 1, wherein the plurality of home network MCC and MNC pairs are stored in the memory of the mobile station.

No.	Limitation
4	The method of claim 1, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.
6[pre]	A mobile station, comprising:
6[a]	a transceiver being operative to scan to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area;
6[b]	a Subscriber Identity Module (SIM) interface for receiving a SIM;
6[c]	a processor being operative to:
6[d]	select and register with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of Preferred PLMN (PPLMN) list;
6[e]	compare the MCC and MNC pair of the selected network with a plurality of home network NICC and MNC pairs corresponding to the home networks of the HPLMN list and associated with a home network display name;
6[f]	for the comparison: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on the SIM for the comparison based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station for the comparison;
6[g]	cause the home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual of the mobile station based on identifying a match between the MCC and MNC pair of the selected network and one of the home network MCC and MNC pairs; and
6[h]	otherwise cause an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs.

No.	Limitation
7	The mobile station of claim 6, wherein the plurality of home network MCC and MNC pairs are stored on the SIM.
8	The mobile station of claim 6, wherein the memory is separate and apart from the SIM in the mobile station.
9	The mobile station of claim 6, wherein a Location Area Code (LAC) is used in addition to the MCC and the MNC in the acts of comparing and identifying.
11[pre]	A computer program product, comprising:
11[a]	a computer storage medium;
11[b]	computer instructions stored on the computer storage medium;
11[c]	the computer instructions being executable by a processor for executing the steps of:
11[d]	causing a scanning process to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within a coverage area;
11[e]	selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PLMN) list;
11[f]	comparing the MCC and MNC pair of the selected network with a plurality of home network MCC and MNC pairs corresponding to the home networks in the HPLMN and associated with a home network display name;
11[g]	for the comparing: using a plurality of home network MCC and MNC pairs from the HPLMN list stored on a Subscriber Identify Module (SIM) for the comparing based on identifying that the plurality of home network MCC and MNC pairs are stored on the SIM, and otherwise using a plurality of home network MCC and MNC pairs stored in memory of the mobile station for the comparing;

No.	Limitation
11[h]	causing the home network display name which is the same for all home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC am MNC pair of the selected network and one of the home network MCC and MNC pairs; and
11[i]	otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs.
12	The computer program product of claim 11, wherein the plurality of home network MCC and MNC pairs are stored in the SIM.
13	The computer program product of claim 11, wherein the plurality of home network MCC and MNC pairs are stored in the memory of the mobile station.
14	The computer program product of claim 11, wherein a Location Area Code (LAC) is used In addition to the MCC and the MNC in the acts of comparing and identifying.
19[pre]	A network name displaying method in a mobile station, the method comprising:
19[a]	scanning to receive a plurality of Mobile Country Code (MCC) and Mobile Network Code (MNC) pairs corresponding to a plurality of wireless communication networks within coverage area;
19[b]	selecting and registering with a wireless communication network associated with one of the received MCC and MNC pairs, giving a preference to home networks of a Home Public Land Mobile Network (HPLMN) list over non-home networks of a Preferred PLMN (PPLMN) list;
19[c]	causing a home network display name which is the same for all of the home network MCC and MNC pairs to be visually displayed in a visual display of the mobile station based on identifying a match between the MCC and MNC pair of the selected network, and one of the home network MCC and MNC pairs; and

No.	Limitation
19[d]	otherwise causing an alternate display name to be visually displayed in the visual display based on identifying no match between the MCC and MNC pair of the selected network and the home network MCC and MNC pairs.